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HIP-JOINT FUSION AND THE SHELF OPERATION

BY P. M. GIRARD, M.D., DALLAS, TEXAS

These operations on the hip are designed to establish better bony contact between the graft and its bed, both as to the area of contacting surface and the firmness of fixation of the graft. Upon these two factors depends the success of any bone graft.

The various methods make use of a free bone graft taken from the crest of the ilium, an osteotome is employed for removing the graft and for flaring out the two cortical areas to form the wings.

The intra-articular hip fusion to be described combines the principles of intra-articular and extra-articular grafts and is the method which we are at present using routinely. The graft is firmly wedged at each end into the ilium and the trochanter, and its middle section is inserted into the head and neck of the femur. If a strictly extra-articular fusion is desired, the entire graft is flared out and wedged into the ilium and trochanter only.

In the shelf operation, not only are the contacting surfaces broader, but the shelf is more like a roof and points downward, which is important. So many of the shelf operations described do not fulfil this requirement. Under weight-bearing, when the femoral head strikes an upward inclined shelf, it is forced outward instead of inward, and tends to dislocate. Another advantage is that when the graft is driven into position under the wings it is very firm and will not be dislodged during the necessary moving of the patient in preparation for application of the cast.

It is not the purpose of this presentation to discuss the relative merits of the intra-articular or the extra-articular methods of fusion, but merely to describe the procedures mentioned. They are in reality modifications of Ghormley's operation.¹

EXTRA-ARTICULAR FUSION

The incision of Smith-Petersen is slightly modified in that the lower end points outward, so that the muscles may be reflected and held back with a towel placed around the outside of the trochanter. If a strictly extra-articular graft is desired, two wings are turned back along the rim of the acetabulum and in the trochanter (Fig. 1). The capsule is not opened. In turning the wings back, it is important that the area which will form their bases be marked by small incisions through the outer cortex to prevent splitting of the wings at their bases. This marking is best done with the corner of an osteotome. The wings should be fairly thick and should include some cancellous bone with the cortex.

Next, the graft is taken from the crest of the ilium. Length should be measured from the outside of the trochanter to the upper end of the incision in the acetabular rim, and the graft from the crest should be cut

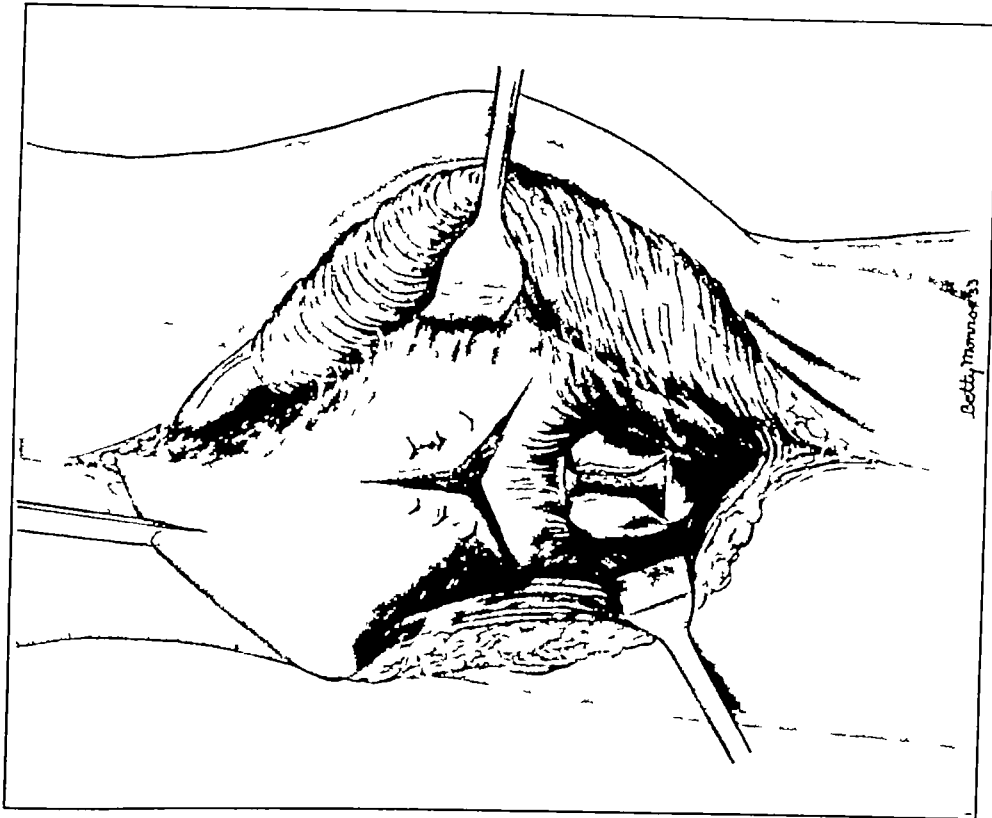


Fig 1

Extra-articular fusion Two wings have been formed in the trochanter and in the rim of the acetabulum Note the markings through the outer cortex at the bases of the wings on the ilium

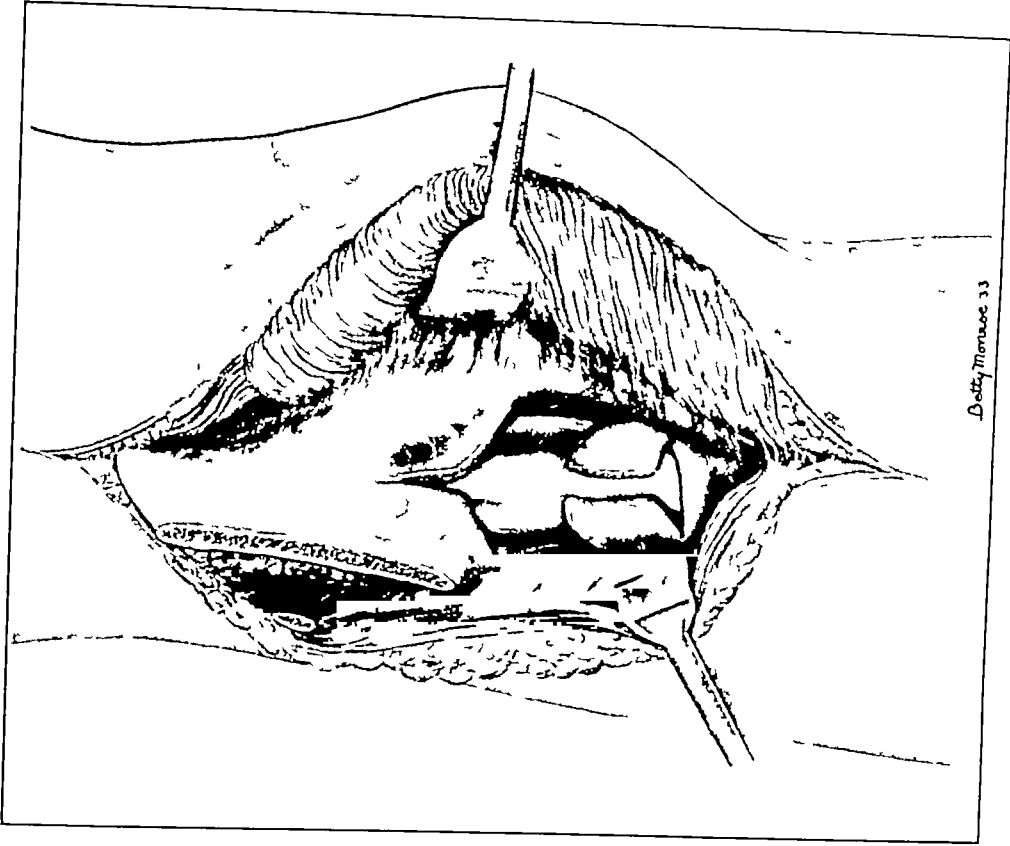


Fig 2

Extra-articular fusion A graft from the crest has been prepared by turning out two wings the entire length of the graft The graft is shown in position under the two wings on the ilium and the trochanter



FIG 1
Extra-articular fusion Double-wing-back method



FIG 3
Model illustrating double-wing-back extra-articular fusion

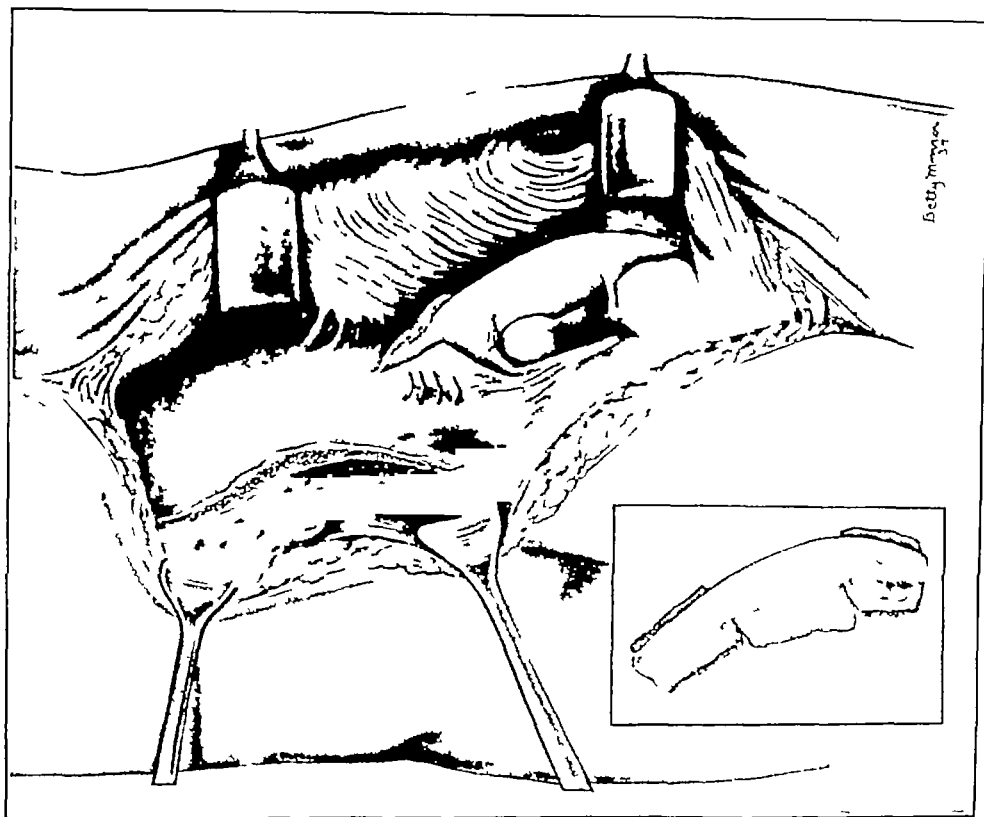


FIG 6

The graft is in position with either end under the wings in the ilium and the trochanter. The middle section is deep in the groove in the head and neck of the femur.

The insert shows the graft from the crest of the ilium with two wings turned up at either end. The middle portion is not disturbed.

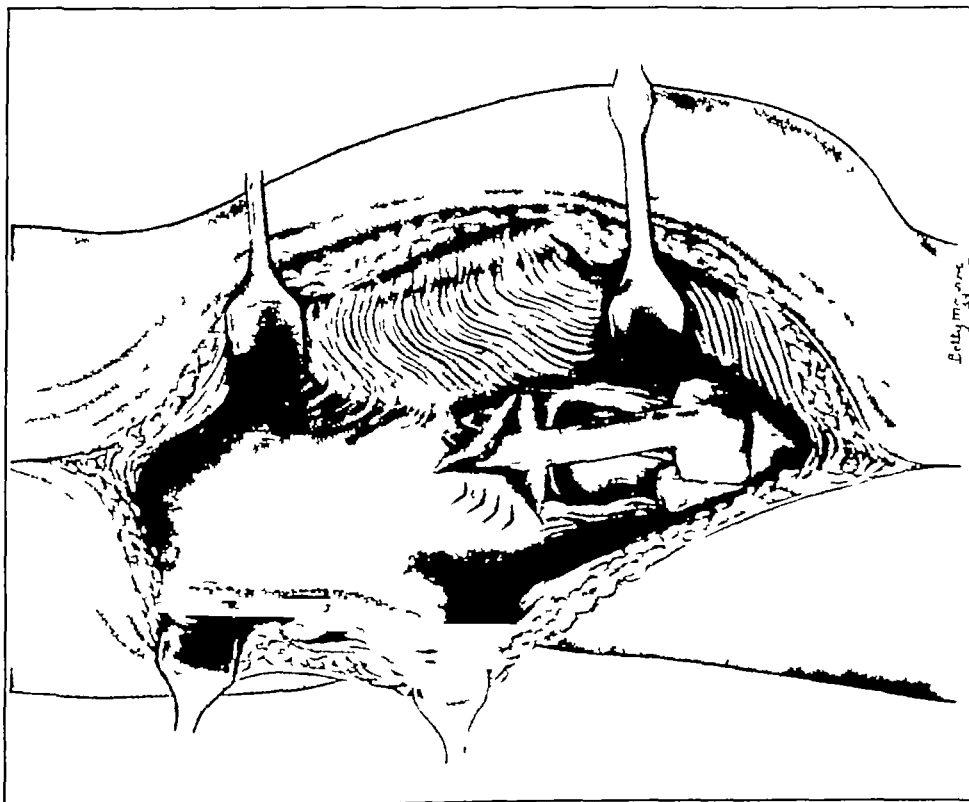


FIG 5

Intra-articular fusion. A graft from the crest of the ilium is being placed in position under the wings in the acetabular rim. Note the groove in the head and neck of the femur which is to receive the middle of the graft.

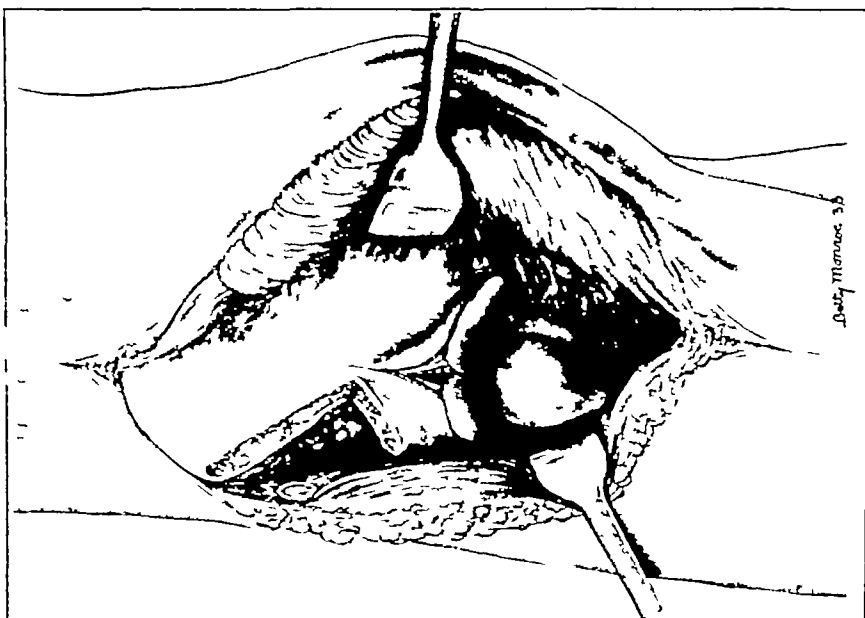


FIG 5

A shelf formed from a portion of the crest of the ilium is placed in position under the wings in the acetabular rim. Note the transverse cut through the outer cortex of the shelf to permit bending in the form of a roof.



FIG 7

Intra-articular fusion Double-wing-back method

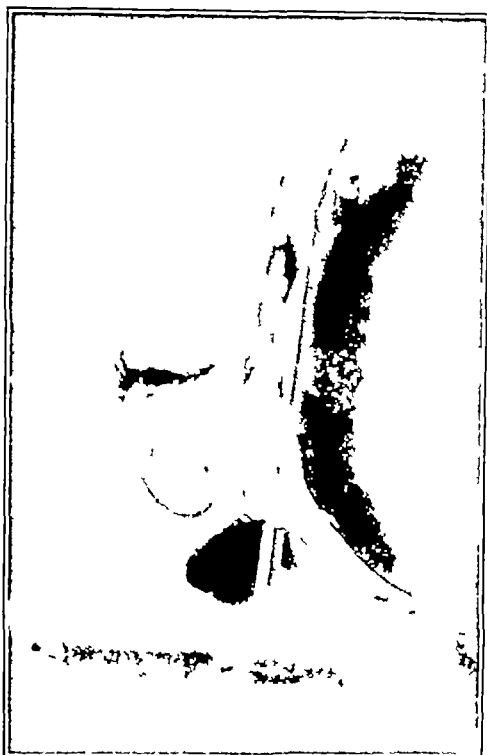


FIG 9-A

Anteroposterior view of model showing
shelf graft in position



FIG 9-B

Lateral view of model showing shelf
graft in position

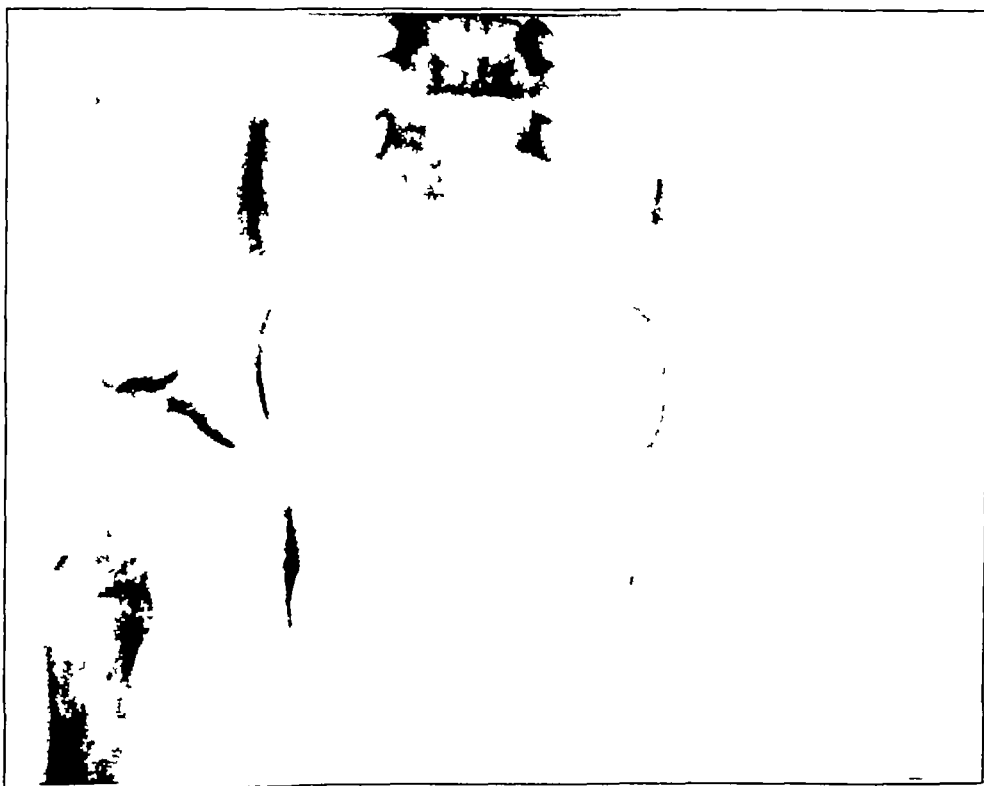


FIG 10

Double-wing-buck shelf Eighteen months after operation

sufficiently long to span this area. The cortex on either side is turned back to form two wings. The areas which will form the bases of the wings should be marked with the corner of an osteotome, as already mentioned, to prevent splitting before the wings are flared out.

The final step is the levering open of the two wings in the ilium and trochanter under which is slipped the graft, its two spread wings fitting firmly under the raised wings of the trochanter and the acetabular rim (Fig. 2). A slight increase in abduction of the leg jams the graft even more firmly into position.

INTRA-ARTICULAR FUSION

The technique is exactly the same as for extra-articular fusion except that the capsule is opened, the hip joint is cleaned out if desired, and a groove is cut in the head and neck of the femur similar to the technique described by Ghormley. The middle section of the graft from the crest of the ilium is not turned back in forming the wings, but is left just as it is except that the outer cortical surfaces have been sacrificed. The wings are formed by approximately one inch of each end of the graft (Fig. 6). The wings of the graft are inserted under those of the ilium and trochanter in the same manner as are those of the extra-articular graft, the middle vertical section of the graft, however, is driven into the groove in the head and neck of the femur.

The turning back of the wings gives a very secure graft and also a very large contacting raw surface of bone at each end.

SHELF OPERATION

Wings are formed in the rim of the acetabulum, as illustrated in Figure 8. The incision in the rim for forming the wings should be shaped like a long, pitched roof. The graft from the crest is taken with the osteotome held obliquely so that a long beveled cut surface in the graft may be obtained. Care should be taken to hold the osteotome at such an angle that the long beveled edge will fit downward against the surface of the ilium and not upward against the wings. The outer cortex of the graft is cut transversely and the two halves are bent downward in the shape of a roof (Fig. 8).

The wings in the ilium are beveled up, and the graft is inserted beneath them and driven upward firmly into place.

1. GHORMLEY, R. K. Use of the Anterior Superior Spine and Crest of Ilium in Surgery of the Hip Joint. *J. Bone and Joint Surg.*, XIII, 784 Oct. 1931.

CONGENITAL COXA VARA

REPORT OF A CASE *

BY DR JULJUSZ ZAREMBA, CRACOW, POLAND

This case is reported because of the fact that congenital coxa vara is comparatively rare, and also because the method of treatment used has proved to be of value. A review of the literature shows that few similar cases of coxa vara have been reported. It is, however, very likely that other cases have been described under various titles.

Since there is much confusion in the classification of the types of coxa vara, it seems wise to define the type with which this paper deals. Congenital coxa vara is applied to those cases in which the following conditions are present: (1) marked faulty development of the femur, (2) a small and imperfectly formed neck, (3) grossly deficient ossification, and (4) separation of a triangular portion of the neck, adjacent to the margin of the head, from the remaining portion of the bone.

CASE REPORT

The patient, a girl, eighteen years of age, complained of pain in the right hip and presented limitation of motion in both hips and a constant limp, resembling in character that of congenital luxation. The limp and the limitation of motion had existed since



FIG 1

Before operation

* From the Service of Prof. Maksymilian Rutkowski, Surgery Clinic, Cracow.

infancy. The pain had appeared after violent exercise a year prior to examination. The patient gave a history of an acute arthritis of both hips fifteen years previously, this affection had lasted a few weeks and there had been no subsequent symptoms or disability.

Examination, on September 23, 1929, showed the patient to be well nourished, of healthy appearance, and with no evidence of organic disease. She walked with a marked limp on the right side and with a gait suggestive of greatly restricted motion in the hips. Marked lordosis was present. The trochanter was prominent on both sides. The Trendelenburg sign was positive on the right, negative on the left. Both hips were held in the position of slight flexion and adduction. The right hip showed 30 degrees of motion in abduction and 85 degrees in flexion. Rotation was markedly limited. When motion was persisted in beyond these limits, pain was experienced. Motion in the left hip was somewhat less restricted than in the right.

Röntgenographic examination (Fig. 1) revealed that the angle of inclination of the neck of the femur was reduced to less than a right angle. The neck was of normal length and apparently placed rather low in the acetabulum. There was a broad, clear band crossing the neck vertically between the head and the remaining portion of the neck. In the right hip, a fragment of bone, triangular in shape, occupied the lower portion of the neck near the head and was bounded by two clear bands which traversed the neck. The inner band was undoubtedly the epiphyseal line. The acetabulum was well formed with a somewhat oblique upper margin.

The usual forms of extension and physiotherapy were carried on for several weeks, with no beneficial results. Exploration of the joint was, therefore, advised and an attempt to mobilize it was proposed.

At operation on March 28, 1930, the hip joint was exposed by the anterolateral route after the detachment of the greater trochanter. The capsule was opened by a cross incision and the femoral head was dislocated in order to obtain a full view of the acetabulum, the head, and the neck. The cartilage of the head and the acetabulum was found to be intact and the ligamentum teres shortened. The neck was shorter than normal, separated from the head by a defect of one centimeter, and filled with dense fibrous tissue. It was decided to construct a pseudarthrosis by excision of the femoral head and dense fibrous tissue and by implantation of the fat tissue about the neck. The trochanter was then reattached to the femur at the lower level and the limb was placed in plaster with the hip in moderate abduction.

Two months later, the reconstructed hip showed a moderate range of active motion, with muscular control of the joint.

One year after the operation, the patient could walk with a fair amount of comfort. The limp was less marked than formerly. The hip was stable and showed a wide range



FIG 2
One year after operation

of painless motion flexion of 80 degrees, abduction of 65 degrees, normal rotation The Trendelenburg sign was negative Shortening of the right femur amounted to from two to three centimeters The roentgenogram (Fig 2) showed a clear joint space and good position of the neck and acetabulum

Information obtained by letter three years after the operation indicated that the limp had not increased and that the hip was stable The patient suffered occasional slight pain, but was able to do housework without difficulty

DISCUSSION

The treatment for coxa vara often recommended in text-books—namely, abduction, either with or without an anaesthetic—does not seem to offer much hope of permanent improvement in this type of deformity The relief from weight-bearing in this position will prevent increasing deformity, but, since the epiphyseal line is vertical, or nearly so, this treatment can achieve little in the way of correction

The only other treatment which until now has offered any real hope of success is the low subtrochanteric oblique osteotomy,—cuneiform osteotomy, or, as proposed by Mommensen, mortise osteotomy (*Zapfenosteotomie*) The aim of this osteotomy is directed toward correcting the deformity, preventing its recurrence, restoring the abduction and extension, and, in unilateral cases, reducing the shortening of the limb The osteotomy should not attempt to restore the axis of the neck of the femur, but should strive to produce a certain amount of coxa valga If this is done, the plane of the epiphyseal line and that of the abnormal clear line of the neck will be nearer horizontal than vertical and the weight will fall more or less at right angles to these lines Weight-bearing will no longer tend to increase the deformity, but, on the contrary, may lead to consolidation of the neck

The number of patients operated upon according to this procedure is small The general impression is that the operation is advisable, provided that the technique is good and the postoperative care is sufficiently long and rational It is necessary to keep in mind that the upper fragment is mobile and liable to be flexed at the hip joint, allowing the lower fragment to slip upward in front of it, in this case the final result is less favorable than before The danger in such an osteotomy arises from the difficulty in technique and the need of accuracy in the postoperative care

Because of the various disadvantages connected with this osteotomy, the method of choice in the case reported was arthroplastic resection of the hip, the usual procedure in cases of late fracture of the neck of the femur If the neck is sufficiently long, this method is advisable, particularly in unilateral cases The mobility is improved, the limp decreases, and the pain diminishes or disappears The hip becomes stable and there is present only a moderate degree of shortening of the limb,—from two to three centimeters The operation is technically easy and the post-operative care presents no special difficulty

TRANSVERSE-WEDGE ARTHRODESIS FOR THE RELIEF OF PAIN IN RIGID FLAT-FOOT

BY ISADOR F. ZADEK, M.D., F.A.C.S., NEW YORK, N. Y.

DEFINITION OF FLAT-FOOT

Flat-foot, as commonly understood, is a condition in which the main or longitudinal arch of the foot is depressed. This is not anatomically true. The arch is secondarily depressed, due to abduction of the foot. A low main arch, without abduction at the mediotarsal and subastragalar joints, is often found in a strong stable foot that is symptom-free.

CLASSIFICATION

Flat feet are perhaps best classified in three groups

1. *Flaccid*

First, we have the so called static, or flaccid, flat foot, in which the main arch is depressed only during weight-bearing. When the superincumbent weight is removed, the main arch assumes a normal contour. The term "flat-foot", as applied to this group, is often a misnomer, because the patients frequently have high arches, and truly the individuals with high arches are the greatest sufferers. In this group the condition is best termed "weak foot", or "abducted foot", because the height of the arch is of relatively little significance. These individuals suffer because the feet are used at a mechanical disadvantage. Normally, the balance of the foot during weight-bearing should be such that a line prolonged along the crest of the tibia would strike the foot in a plane between the first and second metatarsals. During activity, these patients turn their feet outward, as one does normally during relaxation in standing, and the prolonged line noted above strikes medial to the normal plane,—often to the inner side of the first metatarsal. In the attitude of relaxation, the hips are rotated outward slightly and the knees are somewhat flexed. Associated with this attitude, there is a prominence of the medial aspect of the foot in the region of the astragaloscaphoid joint, and the normal contour with convexity outward may be reversed and show a convexity inward. In other words, during activity, the individual uses an attitude which is normal for relaxation, hence, the mechanical weakness. If this attitude is persisted in sufficiently long, it becomes more or less fixed, so that the arch does not return to normal during relaxation.

2. *Spastic*

The second group is the flat foot with peroneal muscle spasm. This is a later stage of development in the untreated foot described in the first

group Here there is resistance to the assumption of a normal contour This is governed particularly by spasm of one group of muscles, the peronei

3 *Rigid*

The third group is the rigid flat foot This is the terminal, or last, stage in which the foot becomes firmly fixed in an attitude of abduction, and a normal balance of the foot cannot be restored by any simple measure This is the group with which this presentation is concerned—a group where the ordinary conventional treatment is unsatisfactory These patients are crippled by the severe pain The operation which the author presents has proved adequate in relieving this pain

SYMPTOMS OF AND CONVENTIONAL TREATMENT FOR VARIOUS FORMS OF FLAT-FOOT

The patients suffering from weak feet come for treatment primarily because of pain and disability This pain may be registered in the foot, usually on the medial side, it may be in the calves, thighs, or back Such patients find their activity limited They walk and stand less and sit and ride more than they did previously Children experience pain or limitation of activity far less frequently than do adults with the same degree of deformity

1 For flaccid flat-foot, the giving of instructions as to the proper balance of the foot during weight-bearing is often all that is necessary to help the patient correct this condition In order to maintain the proper balance, these patients require exercises to strengthen the weakened and underdeveloped structures, especially the tibial muscles, the peroneus longus, the flexor hallucis longus, and the flexor digitorum longus An intelligent individual, without too much extraneous weight to carry about, will often require nothing more than these exercises and proper shoes Indeed, it has been said with much justification that the prognosis is much more concerned with the condition above the shoulders than with that below the knees

This treatment is essential to all patients in this group In addition, many of them require some form of arch support,—either a Whitman foot plate or a simple arch prop of the conventional type No artificial arch, regardless of the type used, is in itself curative

2 The pain in the foot associated with spasm of the peronei is usually considerable and more or less localized in the foot

The spastic flat foot associated with muscle spasm must first be reduced to the flaccid type and then the conventional treatment should be carried out The spasm of the peronei is best overcome by baking and massage and repeated strapping with adhesive plaster to force the foot into slight varus as the peronei relax It may be necessary to apply a plaster-of-Paris bandage

3 The rigid flat foot shows more than ordinary resistance to correction The condition has existed sufficiently long for changes to

have occurred so that resistance to correction is extreme. These patients have lost all "spring" in their gait and they use their lower extremities like pedestals. They have a great deal of pain and disability over a long period of time.

In order to overcome the resistant valgus of this type of foot, the patient is usually given an anæsthetic and the foot is thoroughly stretched in the opposite direction. Then a plaster-of-Paris boot is applied, extending from the toes to the knee, with the foot at a right angle and in an attitude of varus. This treatment frequently fails to accomplish its purpose, as shown by the fact that it is often necessary to repeat this procedure more than once to correct the valgus attitude, if the rigidity has existed for any considerable period of time. This involves many weeks of after-care. Subsequently, the foot is strapped with adhesive plaster and physiotherapy is instituted. Later, Whitman foot plates are applied.

OPERATIONS DEvised FOR TREATMENT OF FLAT-FOOT

The number of operations devised for the treatment of flat-foot is considerable. They may be divided into two groups: (1) operations on the soft parts, (2) operations on the bones. In many cases the two types of procedures have been combined.

In reviewing the literature, one finds that the authors usually do not state what type of flat-foot is under consideration.

The earliest operation for flat-foot is that of Golding-Bird, who, in 1878 and 1880, removed the scaphoid in two cases and in two others combined this procedure with removal of the head of the astragalus. Davy reported the same operation in 1889.

Ogston, in 1884, reported an astragaloscaphoid arthrodesis in which the cut surfaces were approximated with two bone pegs. Hare, in 1889, modified this type of osteotomy, so that the ivory pegs were not required. Schwartz, in 1893, made the correction more complete by enlarging the size of the wedge removed at the astragaloscaphoid joint.

Stokes, in 1885, advised a wedge osteotomy of the head and neck of the astragalus with the base inward, as he felt that this location was the site of deformity in flat-foot, rather than the astragaloscaphoid joint.

This operation was a development of the times, as two opposing views in regard to flat-foot were then held. One group felt that the condition was secondary to ligamentous relaxation; the other, that it was secondary to bony deformity. Cauchoux, in 1908, and Wachter, in 1921, reported more extensive and more complicated osteotomies of the tarsus.

Weinlechner, in 1888, Vogt, Morestin, and Eiselsberg reported astragalectomy for the correction of flat-foot,—a most radical procedure.

Phelps, in 1891, divided and shortened all of the soft structures on the medial aspect of the foot—the reverse of his operation for congenital equinovarus. He later reported a somewhat similar procedure, known

as the "Bond" operation. In this procedure, several cuts were made with a Paquelin cautery at different angles in the soft parts on the medial aspect of the foot, and the foot was then molded into a corrected attitude and fixed by a plaster-of-Paris bandage.

Trendelenburg of Bonn, in 1889, performed a supramalleolar osteotomy of the tibia and fibula similar to that done for old unreduced Pott's fractures. The result is a tilting inward of the ankle as a whole. Hahn reported a similar procedure worked out by him independently. Meyer, in 1890, found this operation successful in several cases.

Hoffa, in 1893, recommended tenotomy of the tendo achillis as an aid in correction of flat-foot. Kohler, in the same year, reported use of the same procedure. Heitle, in 1910, published the report of nine cases in which the patients were able to resume their occupations after achillo tenotomy. Els, in 1913, gave credit for the procedure to Nicoladoni and reported twenty-three cases of flat-foot treated by this method. Friebe, in 1920, reported nine successful cases so treated.

Obaliński, in 1895, seems to have popularized the Gleich operation. He modified the Gleich incision. He made the interesting statement that Gleich died without having performed this operation on the living, but it was used later by Eiselsberg and by Brienner in two cases. The Gleich operation consisted of a subcutaneous tenotomy of the tendo achillis and division of the os calcis diagonally in a line running from an anterior lower border to a posterior upper point. The posterior end which bears the tuberosity was pushed downward and forward and fixed in this position. This restored the angle which the axis of the calcaneus normally forms with the ground, but which disappears in flat-foot.

Muller, in 1902, devised an operation which consisted in drawing the tendon of the tibialis anticus through a canal made in the scaphoid, thus raising the keystone of the main arch. Occasionally, this operation was combined with other procedures,—such as astragaloscaphoid arthrodesis or tenotomy of the tendo achillis. Wilson and Patterson, in 1905, reported the use of the extensor hallucis longus tendon instead of the tibialis anticus.

Ryerson, in 1910, reported transplantation of both peronei across the dorsum of the foot to the internal cuneiform. The newly transplanted muscles showed practically no activity, the improvement being due to removal of a deforming element.

Legg, in 1913, reported transplanting the tibialis anticus tendon from its insertion into the internal cuneiform and first metatarsal base to the scaphoid. Haas, in 1924, reported a number of cases so treated with good results.

Perthes, in 1913, described an operation, known as the "modeling osteotomy." He removed a wedge of bone from the scaphoid and placed it in a damp compress. Next, a vertical osteotomy was made into the os calcis near its anterior edge on the outer side. The wedge of bone

previously removed from the scaphoid was hammered into the gap in the os calcis, thus elongating the outer border of the foot. It was at times necessary to elongate the peroneal tendons. Wilms, in 1914, gave his approval to the Perthes operation and, in addition, fixed the os calcis to the astragalus.

Fischer and Baron, in 1914, reported the use of free tendon grafts from the peroneus longus tendon to help maintain the arch. A hole was drilled into the scaphoid and one end of the free graft was passed through the scaphoid and then fixed under tension into the tibia. Wedge resection of the tarsus was also suggested if necessary. Momburg, in 1912, had described a similar procedure in which he used a double strip of fascia lata.

Meyer, in 1925, reported a method of overcoming spasm of the peronei by exposing the external popliteal nerve just above the head of the fibula and spraying the nerve with ethyl chloride for two or three minutes. This blocked the nerve for about six months.

Miller, in 1927, reported a plastic operation which consisted in exposing, through an incision on the inner side of the foot, the insertions of the tibialis anticus and posticus tendons, as well as the calcaneoscaphoid ligament. With a sharp osteotome, a thin slab of bone was removed from the side of the scaphoid and internal cuneiform. It remained attached to the calcaneoscaphoid ligament with the intervening ligaments holding the thin portion of bone from the scaphoid and internal cuneiform. The lesser ligaments were peeled upward and downward from the astragalus, scaphoid, internal cuneiform, and base of the first metatarsal, and were preserved ready for reattachment. The articular cartilage was removed from the scaphoid, internal cuneiform, and base of the first metatarsal. The heel cord was then lengthened. In some cases, a wedge osteotomy of the neck of the astragalus was done. Next, the foot was placed in adduction and the slab of bone, which included the insertion of the tibialis posticus tendon, was pulled forward and sewed beneath the tibialis anticus tendon to the internal cuneiform and the base of the first metatarsal. The wound was closed and plaster-of-Paris was applied with the foot in adduction.

Schede, in 1928, reported an operation consisting in extensive loosening of the soft parts, including the peeling back of the ligaments between the calcaneocuboid, the internal cuneiform, the first metatarsal, and the scaphoid. Tenotomy of the peroneus brevis was then done. After this, a Z-shaped tenotomy of the tendo achillis was done, followed by an astragaloscaphoid arthrodesis. Repair was made with the foot in an attitude of varus.

Hoke, in 1931, described his procedure which consisted of elongation of the tendo achillis, followed by an arthrodesis between the scaphoid, the internal, and middle cuneiform bones. A block graft, cut from the tibia, was utilized, and the foot was fixed with the forepart in equinus.

RATIONALE OF TRANSVERSE-WEDGE ARTHRODESIS FOR PAINFUL RIGID FLAT-FOOT

In the treatment of flaccid flat-foot, conventional methods are adequate. Unfortunately, this is not true of rigid flat-foot, where stretching under anaesthesia has been the method of choice. The necessity of frequently repeating the procedure on the same patient is evidence of its inadequacy.

An operation is here presented for relief of pain in rigid flat-foot. It is based on the belief that strain, and likewise stability, in the rigid flat foot takes place to a great degree at the joint between the astragalus and the os calcis. The foot may be better balanced by this operative procedure, but the primary consideration is the relief of pain.

This operation is designed to obliterate motion between the astragalus and the os calcis, and to accomplish this in such a manner that the os calcis, in its relation to the astragalus, is in an improved position. This is accomplished by removing a wedge of bone transversely at the astragalocalcaneal joint, thus diminishing the eversion of the os calcis.

It seems to the author that the generally accepted conception of flat-foot is not accurate. In the anatomy of the normal foot, the os calcis and the astragalus occupy roughly the posterior third of the foot.

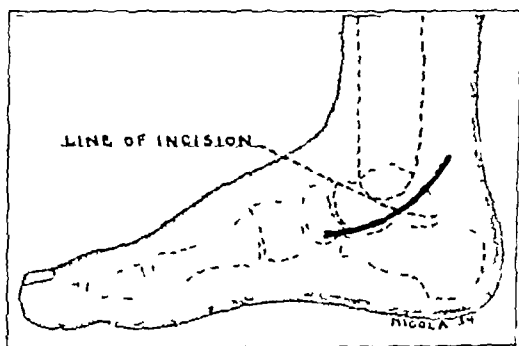


FIG 1

Schematic drawing of transverse-wedge arthrodesis for rigid flat-foot, showing the line of incision.

Anterior to this, there are twenty-four bones, constituting the remaining two-thirds. The posterior portion of the foot is designed for stability and the anterior portion for flexibility. As an illustration of the difference in function between the anterior and the posterior portions of the foot, a person runs up-stairs on his toes, because the shock of impact is lessened as he hurriedly shifts his weight from one foot to the other.

In contrast with this, an individual, falling from a height and landing on his feet, usually sustains a fracture of the os calcis—less frequently of the astragalus—for he lands on the most stable portion of his foot. If neither of these bones is broken, then they may act as a wedge and split the lower end of the tibia.

Normally, the os calcis is situated in a plane on the outer side of the astragalus and is slightly tilted inward, so that, during weight-bearing, its superior border is nearer the mid-line of the body than is its inferior border.

Most arch supports and most operations are designed on the fallacious conception of elevating the keystone of the arch in the astragaloscaphoid region.

If the heel is inverted slightly, so that it is tilted outward, the fore-

foot will follow and thus improve the foot's balance.

If the alignment between the os calcis and the astragalus can be improved and the strain at this joint can be relieved, the patient should experience comfort—if this theory is true. The author has tried this only in cases of rigid flat-foot, although it

is his belief that it would apply in a small number of cases of flaccid foot, where simple measures fail. This procedure has been entirely satisfactory in several cases of rigid flat-foot, and has given complete relief.

One word of caution. The os calcis should not be fixed in inversion to the astragalus, as weight-bearing is done normally in an attitude of slight valgus. If fusion occurs with the heel in slight inversion, the cosmetic appearance is better, but the patient is not pleased with the result and may have pain. This occurred in one foot upon which the author operated, and in one operated upon by an associate.

TECHNIQUE OF THE OPERATION

An incision, two and one-half inches long, is made in the line of the tendon of the tibialis posticus, beginning posterior to the astragaloscaphoid joint. The tendon sheath of the tibialis posticus tendon is opened and the tendon retracted by passing around it a tape moistened in warm saline solution. Exposure to the bone is made by sharp dissection and, with a thin osteotome or periosteal elevator, the heavy ligaments are peeled back from the bone at the level of the joint between the astragalus and the os calcis. If the osteotome has a gentle curve on its flat side, this exposure is more easily made. No mallet is used. One

must be careful to keep close to the bone and work the sharp edge of the instrument posteriorly toward the heel and anteriorly toward the scaphoid. As one works the instrument posteriorly, the tendons of the flexor digitorum longus and the flexor hallucis longus, with the posterior tibial

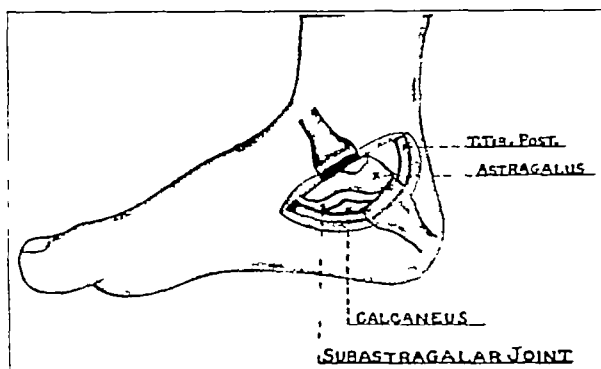


FIG 2

Showing the exposure of the joint between the astragalus and the os calcis. The tibialis posticus tendon has been retracted posteriorly.

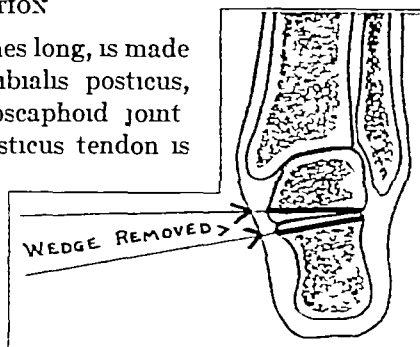


FIG 3

Showing where the wedge of bone is removed to include the articular cartilage of the astragalus and the os calcis. The inclination of the os calcis in this illustration should be greater.

artery and nerve, are lifted *en masse* from the bone. With blunt retractors, the joint between the astragalus and the os calcis is exposed. A transverse wedge of bone is removed from the astragalocalcaneal joint, with its base, three-eighths of an inch wide, presenting on the medial aspect of the foot. The excised wedge must include the joint. It must be remembered that the joint between the astragalus and the os calcis is somewhat irregular in contour and the wedge, as removed, usually consists of several separate fragments. For the deeper portion of the joint—that is, on the outer side—a small curette is often necessary.

The deeper structures and the tendon sheath are closed with chromic gut and the skin with silk.

A plaster-of-Paris bandage is applied with the foot at a right angle; the heel is apparently slightly inverted, with the forefoot down. If this inversion of the heel is slight, it will be only apparent, not real. When the plaster is removed, the heel will be in the neutral position, or slightly everted.

This plaster, applied at the time of operation, is removed after four weeks and another walking plaster is applied. After removal of the first plaster, impressions are made for the construction of ordinary Whitman plates. The patient is encouraged to bear weight while wearing plaster.

The second plaster-of-Paris bandage is removed after about eight weeks and the Whitman plates are applied. Baking and massage are given after the removal of the plaster. The patient gradually discards the crutches and cane.

CASE REPORTS

CASE 1 A S, aged sixteen years, a white male (H J D No 28865), was first seen in the Out-Patient Department of the Hospital for Joint Diseases on March 31, 1930. The patient came to the Hospital because of pain in his right foot, which was particularly noticeable when standing. Any motion of the foot accentuated this pain and there was marked limitation of adduction of the right foot. There was no history of injury.

The x-ray examination was negative.

Physiotherapy was instituted, but, in spite of this, on April 3, 1930, it was noted that the right foot was rigid.

The patient was admitted to the Hospital for Joint Diseases on July 29, 1930.

Examination at this time showed that he was in good general condition. He walked without assistance and with a moderate limp on the right side. He showed a marked degree of bilateral flat-foot. The right foot was completely rigid, dorsiflexion and plantar flexion were about half normal. The right foot was fixed in abduction and could not be adducted at all. The left foot was flaccid. A stretching of the right foot was advised.

On July 30, 1930, the right foot was thoroughly stretched into adduction and a plaster-of-Paris bandage was applied, extending from the toes to the knee. The patient was discharged from the Hospital on crutches and was later seen in the Out-Patient Department.

On September 16, 1930, the plaster-of-Paris boot was removed. The patient was fitted with Whitman foot plates and the right foot was strapped with adhesive plaster.

On October 17, 1930, examination showed some spasm of the peronei, the foot was

rigid in abduction and the patient was having a great deal of pain. He was unable to get about because of the pain and deformity. Readmission to the Hospital was advised.

The patient was readmitted to the Hospital for Joint Diseases on November 24, 1930, examination on November 26, 1930, revealed that the stretching had failed, and a transverse-wedge arthrodesis was advised.

On November 28, 1930, a transverse-wedge arthrodesis was done on the right foot. The operation was performed under the tourniquet. The wedge removed from the medial aspect of the joint between the astragalus and the os calcis was about three-eighths of an inch wide at its base. A plaster-of-Paris walking bandage, extending from the tips of the toes to the knee, was applied, with the heel in moderate inversion and the forefoot down. The patient was discharged on December 9, 1930.

On December 31, 1930, the plaster was removed. The wound was found to have healed by first intention and the sutures were removed. Fixation between the astragalus and the os calcis was progressing nicely. A new walking plaster-of-Paris bandage, extending from the toes to the knee, was applied, with the foot at a right angle and the heel inverted.

The plaster was removed on February 6, 1931, and discarded. Examination at this time showed no spasm of the peronei. Fixation between the astragalus and the os calcis was good. The general contour of the foot was practically normal. Dorsiflexion and plantar flexion were free.

On February 11, 1931, the patient stated that he was better pleased with the right foot, which was operated on for rigidity, than with the left foot, which was not rigid and which was not operated upon. Examination showed that the right foot was better balanced than the left. The right foot was not as broad as the left, as the eversion of the os calcis was diminished. There was good fixation between the astragalus and the os calcis.

On September 11, 1931, the patient stated that he was able to run and play football and to indulge without pain in the general activities of the other boys.

On October 26, 1931, the Whitman plate was discarded and ordinary supportive arches were applied. The patient walked without a limp, dorsiflexion and plantar flexion were free, and there was no sensitiveness about the foot.

On May 9, 1932, the patient stated that he was able to work all day as a clerk in a grocery store. There was good fixation between the os calcis and the astragalus on the right. The dorsalis pedis pulse, as well as the posterior tibial pulse, was normal. The patient was thoroughly pleased with the result of the operation. He was still wearing the supportive arches.

When last seen, on June 26, 1933, he had no pain in the right foot. Dorsiflexion of the right foot was permitted to 85 degrees. There may have been a trace of motion between the astragalus and the os calcis on both sides. Free action of the tibialis posterior tendon could be felt.

Four other patients (seven feet in all) have been operated upon with uniform relief of pain. Condensed reports of the other cases are as follows:

CASE 2. M. L., aged sixteen years, a white male (H. J. D. No. 33759), was first seen on April 14, 1931. This patient came to the Hospital because of pain in the feet. He had been treated previously in another hospital where the feet had been strapped with adhesive plaster and combination Whitman foot plates had been given. In spite of this treatment, the pain had persisted. There was no history of injury.

Examination on admission showed a rather tall boy in good general physical condition, but showing evidence of an endocrine disturbance. His feet were abducted and the longitudinal arches depressed. Spasm of the peroneal muscles was noted. This was more marked on the left than on the right. Baking and massage were ordered and the patient was referred to the Neurological Department and to the Throat Department.

A transverse-wedge arthrodesis was performed on both feet on July 10, 1931. The plaster-of-Paris bandages were changed on July 24, 1931, and discarded on September 23, 1931. The valgus deformity was slightly overcorrected in the right foot and the patient had local pain. The left foot was comfortable.

On November 20, 1931, a second operation on the right foot was performed, in which a wedge of bone was removed transversely from the outer aspect of the foot at the level of the joint between the astragalus and the os calcis.

The plaster-of-Paris bandage was removed on January 22, 1932, and discarded and the patient was then allowed to walk with Whitman foot plates.

A letter received from this patient, dated June 15, 1933, stated that he was com-

pletely satisfied with the result of the operation on his feet. He had been working steadily for a year in a hardware store. He stated that he walked well and was getting along very nicely. The pain was completely relieved.

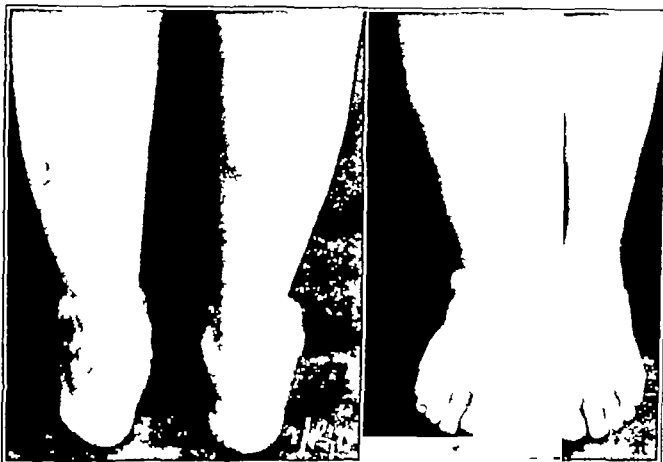


FIG 4

Case 1. A. S., September 11, 1930, showing the position of the feet prior to a transverse-wedge arthrodesis of the right foot. The right foot had been stretched without benefit.

Examination on January 16, 1931, showed an arthritis of the wrist. She was given general care and examined for any possible focus of infection.

On May 20, 1931, she was again seen because of severe pain in the feet. She stated at this time that her wrist was much improved. Examination showed that she had a marked degree of bilateral flat-foot. There was considerable spasm of the peroneal muscles, which could be overcome when the muscles were stretched. The feet were

strapped in inversion and pads were applied. The feet were repeatedly strapped, and on a number of occasions physiotherapy was given without relief.

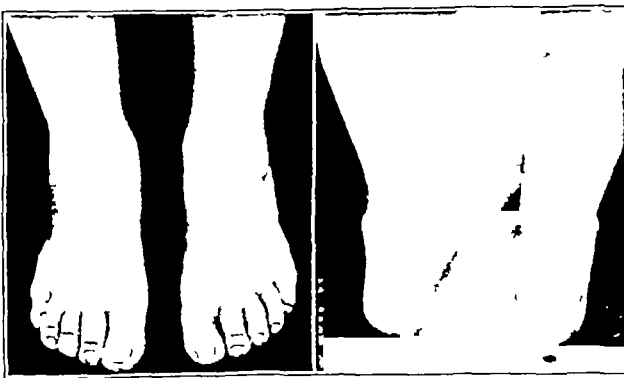


FIG 5

Case 1. A. S., February 27, 1931, showing the result of the operation.

A transverse-wedge arthrodesis was performed on both feet on June 19, 1931. On July 3, 1931, the wounds were dressed. They were found to have healed by primary union. The plaster-of-Paris bandages were removed and light walking plasters were applied, with the heels inverted slightly and the forefeet down.

The patient was then allowed out of bed and permitted to walk with crutches.

On August 28, 1931, the walking plasters were removed, impressions were made for the construction of combination Whitman foot plates, and new plasters were applied.

On September 28, 1931, the plasters were removed and discarded, and the patient was allowed to walk with the combination Whitman foot plates.

When last seen on February 5, 1933, the patient stated that, as far as her feet were concerned, she was comfortable. She had had, however, a flare-up of the polyarthritis. Both feet could be dorsiflexed to 85 degrees and plantarflexed to 125 degrees. The dorsalis pedis pulse as well as the posterior tibial pulse, was good in both feet. The feet were rather cold.

CASE 4 G S, aged sixteen years, a white male (H J D No 30918), was first seen in the Out-Patient Department of the Hospital for Joint Diseases on December 26, 1930. He stated that for the past year he had been having severe pain in both feet, this pain was worse in the right foot. For four days prior to examination, this pain had been quite acute in the left foot.

Examination, on December 26, 1930, showed that the patient presented bilateral flat-foot. The left foot was rigid. There was no spasm of the peroneal muscles on the right. Admission to the Hospital for Joint Diseases was advised.

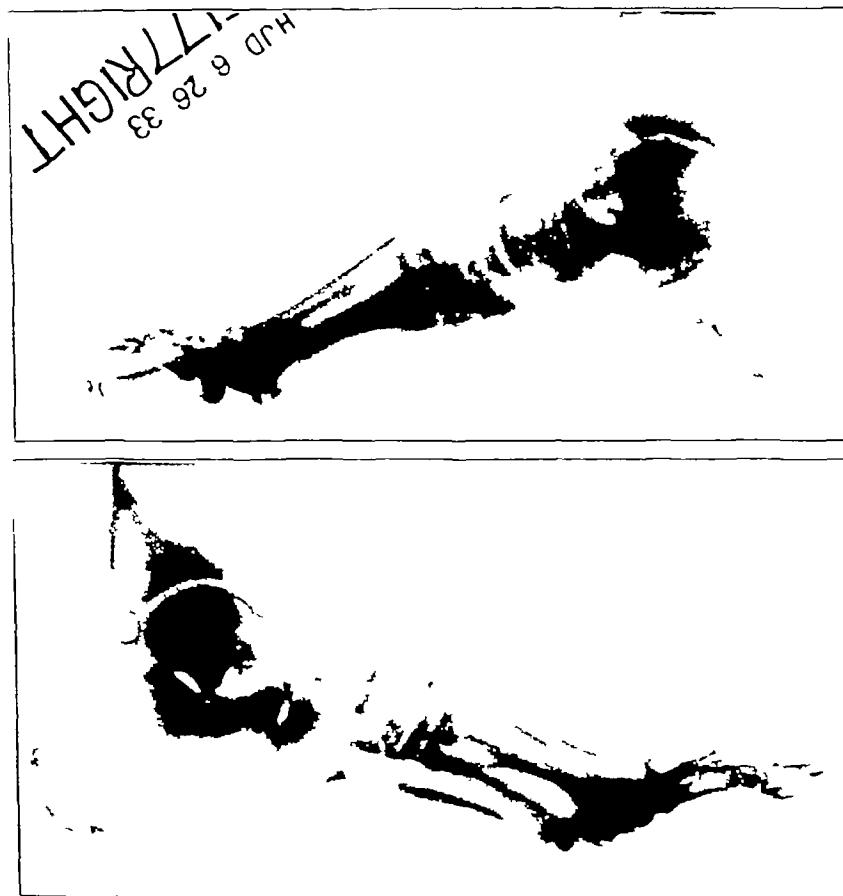


FIG 6

Case 1 A S, June 26, 1933 showing fusion between the os calcis and the astragalus on the right. The left foot is shown for comparison.

On January 2, 1931, a transverse-wedge arthrodesis was performed on the left foot, and the right foot was stretched

The postoperative course was uneventful. On February 18, 1931, the plasters were removed. Examination showed that the wound on the left foot had healed by primary union. The sutures were removed. Impressions were made for the construction of combination Whitman foot plates, and walking plasters were applied.

On March 11, 1931, the plasters were removed, and Whitman plates were applied.

When last seen, on December 2, 1933, the patient was in excellent condition. He was comfortable, had no pain in his feet, and was able to resume his regular occupation.

CASE 5 M A, aged forty-three years, a colored female (H J D No 20894), was first seen in the Hospital for Joint Diseases on June 10, 1930, because of pain in the feet. Examination at this time showed that she had very marked rigid bilateral flat-foot and bilateral hallux valgus. There was marked abduction of both feet. On the left side, the second toe overlapped the first and there was practically external dislocation at the first metatarsophalangeal joint. The distal phalanges of the second and third toes were markedly deviated outward. The fingers also showed an ulnar deviation at the metacarpophalangeal joints. The patient showed a generalized arthritis.

On June 13, 1930, Kleinberg's operation was performed to correct the hallux valgus. (This operation consisted of removal of the prominence of the head of the first metatarsal on its medial aspect and correction of the abduction at the internal cuneiform metatarsal joint by bony resection.)

On January 23, 1931, a transverse-wedge arthrodesis of the joint between the astragalus and the os calcis was performed on both feet. Following operation, plaster-of-Paris bandages, extending from the toes to the knees, were applied, with the feet at a right angle, the heels inverted, and the forefeet down. The postoperative course was uneventful.

On April 3, 1931, new walking plasters were applied, and the patient was discharged from the hospital.

On April 23, 1931, the plasters had been discarded and the patient was walking with crutches. Dorsiflexion was permitted to slightly less than a right angle. Plantar flexion was limited at about 110 degrees in both feet. At this time the patient was wearing combination Whitman foot plates.

When last seen on September 13, 1933, the patient was in fair general condition. The operative incisions had healed by primary union. She was reasonably comfortable. She could walk better than she could prior to operation and had but little pain. Her feet were somewhat better balanced than before operation.

CONCLUSIONS

A simple operative procedure for the relief of pain in rigid flat-foot consists of a transverse-wedge arthrodesis between the os calcis and the astragalus.

Five patients (eight feet) were operated upon three or four years ago. In two of these patients, the rigid flat feet were secondary to arthritis. All of these operations were successful in relieving pain.

The loss of motion between the os calcis and the astragalus adds no stiffness to the foot, as it is rigid prior to operation.

The patients do not ordinarily come for treatment because of stiffness, but for the relief of pain.

In its fusion with the astragalus, the os calcis should not be allowed to assume an inverted position. Such a position may give a better cosmetic appearance, but functionally it is not satisfactory.

Patients with circulatory impairment in their feet should not be subjected to this operation

The author wishes to thank Dr Samuel Kleinberg of the Hospital for Joint Diseases for the privilege of operating upon the patients whose cases are reported, and Dr T Nicol for the three drawings used to illustrate the operative procedure

BIBLIOGRAPHY

- ALTAKOFF, PETER Operative und postoperative Behandlung des Plattfusses Ztschr f orthop Chir, LV, 254, 1931
- BRENNER, ALEXANDER Zur operativen Behandlung des Plattfusses nach A Gleich. Wiener klin Wchnschr, VII, 437, 1894
- BROCKHOFF, ALBRECHT Über Aetiologie und Behandlung des erworbenen Plattfusses Inaugural-Dissertation Bonn, C Georgi, 1890
- BRODNITZ Eine Modifikation der Müllerschen Plattfussoperation Med. Klin, XVI, 378, 1920
- CACHOY, ALBERT Le traitement sanglant du pied plat valgus inveteré Rev de Chir, XXXVIII, 700, 1908
- DAVIS, G G The Treatment of Flat-Foot and Acquired Valgus Trans Coll Physicians, Series 3, XIX, 155, 1890
- DAVY, RICHARD On Excision of the Scaphoid Bone for the Relief of Confirmed Flat-Foot Lancet, I, 675, 1889
- ELS, HEINRICH Klinische und experimentelle Erfahrungen über die offene Achillotenotomie (Nicoladoni) bei schweren Plattfüßen Beitr z klin Chir, LXXXVIII, 157, 1913
- FISCHER, ALADAR, UND BARON, ALEXANDER Beitrag zur operativen Behandlung des spastischen Plattfusses Zentralbl f Chir, XLI, 755, 1914
- FRANKS, KENDAL On Flat-Foot Treated by Ogston's Method Trans Acad Med Ireland, III, 148, 1885
- FRIEBE, WERNER Über die Achillotenotomie nach Nicoladoni bei Plattfüßen Inaugural-Dissertation. Leipzig, Sturm & Koppe (A Denhardt), 1920
- GEISLER, PAUL Beitrag zur Entstehungsweise und Behandlung des angeborenen Plattfusses Inaugural-Dissertation Greifswald, Julius Abel, 1883
- GOLDING-BIRD, C H Operations on the Tarsus in Confirmed Flat-Foot Lancet, I, 677, 1889
- HARE, A. W Extreme Flat Foot, Operation, Recovery, Remarks Lancet, II, 953, 1889
- HASS, JULIUS Eine Radikalmethode zur Behandlung des kontrakten Plattfusses Ztschr f orthop Chir, XLV, 483, 1924
- HEIDENHAIN, L Allerlei über den Plattfuss und seine Behandlung nebst Beschreibung einer neuen Plattfusseinlage Deutsche Ztschr f Chir, XLIV, 472, 1897
- HERTLE, JOSEF Erfolge mit der Ausschaltung der Achillessehne beim schweren Plattfuss nach Nicoladoni Arch f klin Chir, XCIII, 629, 1910
- HOFFA, A Beiträge zur Lehre und Behandlung des Plattfusses Verhandl d Gesellsch. deutscher Naturf u Ärzte (65 Versammlung, 1893), II Theil, 2 Hälfte (Med Abt.), S 124 Leipzig, F C W Vogel, 1894
- HOKE, MICHAEL An Operation for the Correction of Extremely Relaxed Flat Feet J Bone and Joint Surg, XIII, 773, Oct 1931
- HUMPHRY Note on the Dissection of Flat-Foot J Anat and Physiol, n s V, 102, 1890
- KIRMISSON, E Du pied plat valgus douloureux, et en particulier des differents procédés d'ostéotomie applicables à la cure de cette affection Rev d Orthop, I, 49, 1890

- KOHLER, GUSTAV Zur Aetiologie und Behandlung des beginnenden Plattfusses
Inaugural-Dissertation Würzburg, H Sturtz, 1893
- LEGG, A T The Treatment of Rigid Flat-Foot Excision of Scaphoid Boston Med
and Surg J, CLVI, 741, 1907
- The Treatment of Congenital Flat-Foot by Tendon Transplantation Am
J Orthop Surg, X, 584, May 1913
- LILIENFELD, A Was muss der praktische Arzt vom spastischen Plattfuss und seiner
Behandlung wissen? Med Welt, V, 1457, 1931
- MEIER, HERMANN Die Behandlung des Plattfusses durch Peroneusvereisung Beitr z
klin Chir, CXXXV, 150, 1925
- MEYER, WILLY Operative Treatment of Flat-Foot by Supramalleolar Osteotomy
New York Med J, LI, 566, 1890
- MILLER, A G Clinical Lecture on Flat-Foot Edinburgh Med J, XXXV, 428, 1889
The Treatment of Flat-Foot Trans Med-Chir Soc Edinburgh, n s
IX, 169, 1889-1890 (Also in Edinburgh Med J, XXXVI, 221, 1890)
- MILLER, O L A Plastic Flat Foot Operation J Bone and Joint Surg, IX, 84, Jan
1927
- MOMBURG Die Bildung eines Lig tibio-naviculare durch freie Fascientransplantation bei
Plattfuss Zentralbl f Chir, XXXIX, 346, 1912
- MORESTIN, H Pied plat invétéré et irréductible traité par l'astragalectomie Bull et
Mém Soc Anat de Paris, Série 6, III, 205, 1901
- Résultats éloignés de l'arthrodèse astragalo-scaphoïdienne dans le pied
plat valgus douloureux de l'adolescence Bull et Mém Soc de Chir de Paris,
XXXVIII, 1035, 1912
- MÜGGE, HANS Die operativen Methoden der Behandlung schwerer Fälle von Plattfuss
mit besonderer Berücksichtigung der supramalleolaren Osteotomie Inaugural-
Dissertation Greifswald, Julius Abel, 1893
- MÜLLER, EUGEN Ueber die Resultate der Ernst Muller'schen Plattfussoperation
Beitr z klin Chir, LXXXV, 424, 1913
- OBALINSKI Eine Modification des Gleich'schen Operationsverfahrens beim Plattfuss
Wiener med Presse, XXXVI, 1537, 1895
- Modification der von Gleich zur Heilung des schmerzhaften Plattfusses
angegebenen Operation Wiener klin Wchnschr, VIII, 645, 1895
- OGSTON, ALEXANDER On Flat-Foot, and Its Cure by Operation Bristol Med-Chir J,
II, 1, 1884 (Also in Lancet, I, 152, 1884)
- OLIVIERI, E M Resultados obtenidos en el tratamiento del pie plano valgus doloroso
por la operación de Nicoladoni Rev Asoc Méd Argentina, XXIV, 474, 1916
- OPENSHAW, T H Some Points in the Etiology and Treatment of Acquired Flat Foot
Clin J, V, 106, 1894
- PALZER, PHILIPP Über Sehnen transplantation bei statischem Plattfuss Inaugural-
Dissertation Giessen, v Münchow, 1904
- PERTHES Über modelherende Osteotomie bei Plattfussen mit schwerer Knochendeformi-
tät Zentralbl f Chir, XL, 548, 1913
- PHELPS, A M The Etiology, Pathology, and Treatment of Flat-Foot Post-Graduate,
VII, 104, 1892
- RIDDELL, J S Flatfoot, Its Pathology, Causation and Treatment Internat Clin, I,
244, 1893
- RYERSON, E W Tendon Transplantation in Flat-Foot Am J Orthop Surg, VII, 505,
May 1910
- SCHLDE, FR Die Operation des Plattfusses Ztschr f orthop Chir, L, 528, 1928
- SCHWARTZ, ED Du traitement du pied plat valgus douloureux invétéré par la tarsec-
tomie cunéiforme interne Rev d'Orthop, IV, 241, 1893
- STOKES, SIR WILLIAM Astragaloid Osteotomy in the Treatment of Flat-Foot Trans
Acid Med Ireland, III, 141, 1885 (Also in Ann Surg, II, 279, 1885)

- TRFANDELBURG Ueber Plattfus-operationen Verhandl d Deutschen Gesellsch f Chir, XVIII, II Teil, 298, 1889 (Also in Arch f klin Chir, XXXIX, 751, 1889)
- VON FRISCH, O Die Gleich'-che Operation und ihre Bedeutung in der Therapie des Plattfusses Arch f klin Chir, LXXXV II, 324, 1908
- V HOFORKA, OSKAR Die bisherigen Erfolge der Plattfusschirurgie Ztschr f orthop Chir, XVI, 328, 1906
- WACHTER, ALFRED Neue Plattfuss-operationsmethode Ztschr f orthop Chir, XLII, 168, 1921-1922
- WHITMAN, ROYAL The Radical Cure of Confirmed Flat-Foot New York Med J, LV, 227, 1892
- WILMS Operative Behandlung des Plattfusses und Klumpfusses Deutsche med Wehnschr, XXXIX, 1032, 1913
- Operative Korrektur des Plattfusses (Verhandl d Deutschen orthop Gesellsch, XIII Kongress, 1914) Ztschr f orthop Chir, XXXV, Beilageheft, 352, 1915
- WILSON, H A, AND PATTERSON, R V The Combined Operation of Arthrodesis and Transplantation of the Tendon of the Extensor Proprius Hallucis for the Relief of Flat-Foot Am Med, IX, 725, 1905
- ZELLER, ALBERT Zur Behandlung des Plattfusses Med Cor-Blatt d Wurttembergischen ärztl Landesvereins, LXI, 297, 1891

COMPLETE SPASTIC PARAPLEGIA, DUE TO METASTATIC ABSCESS, IN A CASE OF CHRONIC OSTEOMYELITIS OF THE FEMUR, SPONTANEOUS RECOVERY

BY T FRANCIS JARMAN, M D , CARDIFF, WALES

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The following case of spontaneous cure of a complete spastic paraplegia is presented as being of unusual interest both from etiological and clinical points of view

CASE REPORT

N M, a young woman twenty years of age was admitted to the Royal Sea Bathing Hospital on August 22, 1932, suffering from chronic pyogenic osteomyelitis of the lower third of the right femur of one year's duration

On admission to the Hospital, she had discharging sinuses on both the medial and lateral aspects of the lower third of the right thigh, and x-ray examination revealed an extensive pyogenic osteomyelitic process with the lower third of the original shaft of the femur as a sequestrum surrounded by much involucrum formation

This case was considered suitable for radical operation embracing sequestrectomy, saucerization of the diseased area, and subsequent skin-grafting with Thiersch grafts of the cavity so formed, after the manner devised by Mr Basil Armstrong, Medical Superintendent of the Royal Sea Bathing Hospital This operation was postponed until restoration of some movement in the right knee joint, which was quite fixed but not involved in the infective process, had been established

While awaiting this radical operation, the patient developed symptoms and signs of a spastic paraplegia

On September 7, 1932, she first complained of certain subjective sensory disturbances,—“heaviness”, “numbness”, and “tingling” about the feet and legs On September 14, 1932, objective disturbance of sensory perception, with impairment of pain perception up to the level of the ninth rib, first made its appearance, this was accompanied by tendon reflexes typical of an upper motor neurone lesion At this stage the Wassermann reaction was negative, the cerebrospinal fluid was not under pressure, was quite clear, and did not contain abnormal cellular contents, the Queckenstedt test was normal The paraplegic condition became gradually more marked and, by October 10, 1932, was complete, with total absence of voluntary muscular movements in both lower extremities, hyperactive knee jerks, double sustained ankle clonus, and a double extensor plantar response Reflex spastic contractions occurred in flexion, there was complete loss of control over micturition, and complete absence of objective sensory perception up to the level of the fifth rib

On October 11, 1932, two cubic centimeters of lipiodol was injected into the cisterna magna and ten minutes later, with the patient still sitting upright, the whole of the lipiodol was seen to be arrested at the level of the second dorsal vertebra The appearance of the x-ray picture was typical of an extramedullary block which might have been due to an inflammatory or neoplastic process Twenty-four hours later all of the lipiodol was seen to be in the lower cul-de-sac of the spinal subarachnoid space The patient was inverted in an attempt to ascertain the lower extent of the lesion, but the lipiodol would not leave the lower cul-de-sac On October 14, 1932, two cubic centimeters of lipiodol was injected into the spinal subarachnoid space in the lumbar region and the patient inverted The lipiodol was arrested at the level of the body of the fourth dorsal vertebra An x-ray taken prior to injection of the lipiodol revealed no obvious patho-

logical condition of the vertebral column.

A diagnosis of extramedullary compression of the spinal cord was made and a laminectomy was proposed.

Two or three days prior to the date set for operation, however, very slight, but quite definite improvement in the patient's condition was noted, on November 10, 1932, slight objective sensory perception was in evidence and she had some control over micturition. From this point she made a very gradual, but complete recovery from the paraplegic condition. Sensory perception was the first to be recovered fully, complete recovery of voluntary muscular power was next, and the tendon reflexes reverted to normal last. By May 15, 1933, voluntary muscular power and control in both lower extremities, as well as sensory perception, were normal.

On July 12, 1933, the patient developed an abscess which made itself evident at the vertebral border of the right scapula. The abscess was incised, pus was evacuated, and the resulting sinus discharged slightly for six weeks, at the end of which time it healed completely. From this abscess a pure culture of staphylococcus aureus was grown. The site of the chronic osteomyelitis was treated by those radical operative measures previously mentioned, followed by Thiersch skin-grafting, and the cavity epithelialized quickly and completely. On September 10, 1933, the patient was permitted to get up, she made steady progress and was soon discharged from the Hospital.

In May, 1934, she was examined as an out patient. The site of radical operation and skin-grafting in the lower end of the femur was completely epithelialized, and there was good movement at the right knee joint. Voluntary muscular power in the lower extremities, objective sensory perception, and the tendon and plantar reflexes were all quite normal. Since her discharge from the Hospital, she had been up and about all day and her general condition was excellent.

COMMENT

Metastatic abscesses consequent to pyogenic osteomyelitis, due to the staphylococcus aureus, are very common. Fortunately, however, it is extremely rare for such abscesses to be situated in an extradural position in such relation to the spinal cord as to cause signs and symptoms of compression exactly comparable to those produced by an extramedullary tumor of



FIG 1



FIG 2

Fig 1 X-ray showing arrest at the level of the second dorsal vertebra of two cubic centimeters of lipiodol injected into the cisterna magna. Patient in the upright position.

Fig 2 X-ray showing arrest of two cubic centimeters of lipiodol injected into the spinal subarachnoid space by lumbar puncture. Patient in an inverted position, head downward.



FIG 3

X-ray taken immediately after Fig 2, showing distribution of the lipiodol throughout the main nerve trunks.

the spinal cord In the case presented, there can be little question that the cause of the spastic paraplegia was a metastatic abscess derived, through the blood stream, from a primary source of infection in the lower third of the right femur, since this deep-seated abscess eventually found its way through the soft tissues to make itself evident superficially in the region of the vertebral border of the right scapula

It can only be a matter of speculation as to whether this metastatic abscess arose extradurally, without having connection with a focus of bone infection, or whether it developed secondarily to such a focus, perhaps located in a lamina of the second or third dorsal vertebra and too small to be detected by roentgenographic examination

METASTATIC MELANOTIC TUMOR OF THE TIBIA

BY DR CHARLES LASSERRE, BORDEAUX, FRANCE

In June 1928, several months after having performed an amputation of the thigh for metastatic melanotic tumor of the tibia, the author closed his report of the case to the Société de Médecine et de Chirurgie de Bordeaux by saying that he had performed the operation to attenuate the pain and thus avoid torture of the patient, and in that he had succeeded. He also expressed the possibility that he might have the surprise and the satisfaction of a prolonged success, for very little is known of the nature of naevus cells and Masson has thrown a singular light on this obscure question in showing that these pigmented tumors are of nervous origin. He added that, while amputation is often ineffectual, in the treatment of cancer there are surprises with which we must often reckon.

In November 1934, the patient was still living and it is for this reason that her case is reported, for it takes into account the difficulties of diagnosis and makes clear to a certain extent the problem of the best operative treatment.

CASE REPORT

Mme G, fifty-five years of age, was seen in September 1927 because of pain of two years' duration in the right tibia, which had progressively increased. The patient attributed the origin to a severe injury sustained three years previously in the now painful area. From the onset, the pains had been very severe. They appeared every fifteen days, especially during the night, were paroxysmal in character, and deprived the patient of sleep. This condition had persisted until April 1927 when the pains became so acute and so frequent that the patient came to Bordeaux to obtain advice. The physician consulted did not observe any special modification of that portion of the tibia and advised systemic treatment.

When examined in September 1927, the patient appeared extremely emaciated and greatly fatigued. The right tibia had increased in size, and the pain, which was localized in the middle of the bone and in the central area, had become intense. The skin in the anterior internal portion of the leg, in front of the anterior surface of the tibia, was red, hot, painful, and infiltrated. Deep pressure disclosed great sensitiveness. The bone had increased in size and was spindle-shaped in its central portion. The x-ray showed at the center of the diaphysis a small, blurred cavity surrounded by a region of condensed osseous tissue.

On October 13, an exploratory operation was performed. The tibia presented a black appearance. In the zone corresponding to the cavity seen in the x-ray, the cortical area had partly disappeared. Only with great difficulty could the gouge be used, owing to the extreme density of the bone. As the penetration of the bone progressed, the appearance was as if trails of India ink defined the bony trabeculae. The chips of bone were collected and the opening closed without drainage.

The anatomical pathological examination, which it was hoped would be conclusive, did not throw any light on this unusual history. The report read "Old bloody exudate in some normal bony trabeculae."

At the end of fifteen days, the wound had healed and the patient left the Clinic. She had not suffered pain since the operation.

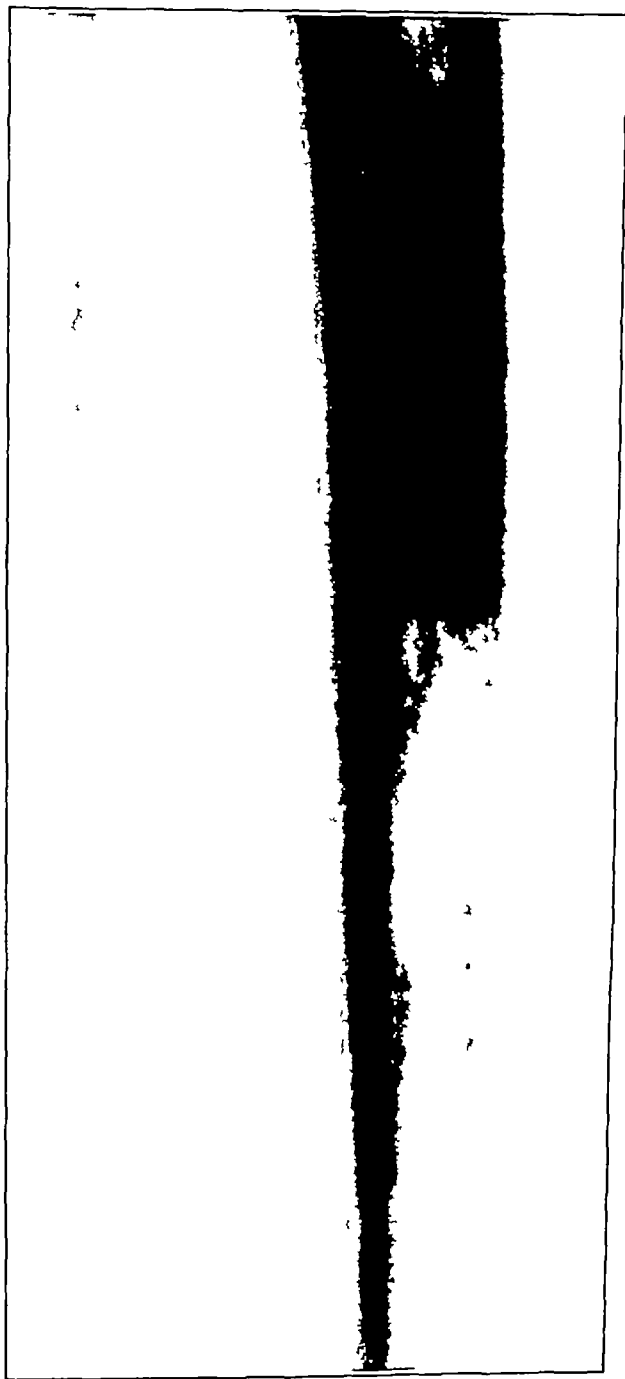


FIG 1

Roentgenogram of the anterior view of the metastatic melanotic diaphysis of the tibia, showing a small cavity, indistinct in outline and surrounded by dense bony condensation, and some osteogenic subperiosteal reaction

relieve the patient of the tibial tumor and, in spite of the presence of extensive glands in the right Scarp's triangle, an amputation of the thigh at the inferior third was performed, without touching these glands

After several days, the physician who had first treated the case wrote as follows "On April 19, 1922, I removed from this patient a small tumor of the face, black in color,

In January 1928, the pain returned and became quite as severe as formerly. In February, the tibia had increased in size and the skin had become red in the area of the previous operation. In view of the appearance of the inflammatory process in this zone, the patient was again operated on and the area opened. There was a very free discharge of blood, which necessitated packing. On February 15, a biopsy was performed and there was found a soft, black tumor occupying the area of the first operation and the contiguous bone.

The anatomical pathological examination at this time gave more conclusive evidence "A solid tumor formed by an extended cellular covering, homogeneous, and partitioned off by collagenic plates. It is formed of polymorphous elements of epithelial appearance, closely packed one against the other, those in the center are rarefied, quite regularly formed, and floating in a cytoplasm more or less colored by the melanotic pigment, having the characteristics of a melanoma" (Dr. Bonnard and Dr. Picchaud).

It was a question, then, of an osseous melanoma. The location in the diaphysis, its roentgenographic aspect, and its anatomical pathological characteristics were in favor of a secondary tumor. But what was the location of the primary tumor? It was at this time that the patient, on further questioning, suddenly remembered that six years previously she had been operated on for a small tumor of the face, black in color.

Therefore, it was decided to

in the region of the right malleolus, by a very small incision. The tumor was of a diameter of six to seven millimeters. I was struck by the color of this tumor and it was only because of the distance from my laboratory that I did not have an examination made of it. In regard to its tibial localization, it was very probably a question of metastasis, rather curious because of the long time which had elapsed and because of the small size and the benign appearance of the primary tumor.

This observation raises interesting questions, for secondary osseous melanomata are exceptional. They are properly classified as *melanocarcinomata*, but it is seldom that the metastatic osseous focus assumes more than a secondary importance. The pseudo-inflammatory appearance of the tumor, which called for opening, appearing at the same time with a marked vascularization, is also rather curious. At the time of the first operation, the wound bled more freely than is usually the case. The nutrient artery of the tibia, which was much larger than usual, bled in spurts and it was necessary to close the opening with a small bone peg. One can reconcile these inflammatory phenomena with the clinical aspect that is observed in the first stages of the malignant transformation of a *naevus*. The x-ray appearance is also new, for, in this case, it was a question of a true bone tumor. In fact, the very limited destructive process was surrounded by a zone of condensation so hard that the gouge had little effect upon it. Until the second operation, the osseous melanoma appeared as a primary localization, and it was only by questioning the patient that the com-



FIG 2

Section of the operative area, showing the cavity and extreme thickening of the cortex. The cavity was filled by a tumor of the color of India ink. The contiguous osseous trabeculae are limited by dense black furrows.

plete history could be reconstructed and a definite relation established between this melanoma and the slight operation performed six years previously

Naevocarcinomata usually present extreme malignancy. Their early and extensive metastasis is such that one cannot help fearing the dissemination of an infectious or parasitic element. One must admit with Delbet that, as is true of all cancers, these naevocarcinomata possess a variable scale of malignancy. There are even some forms which may

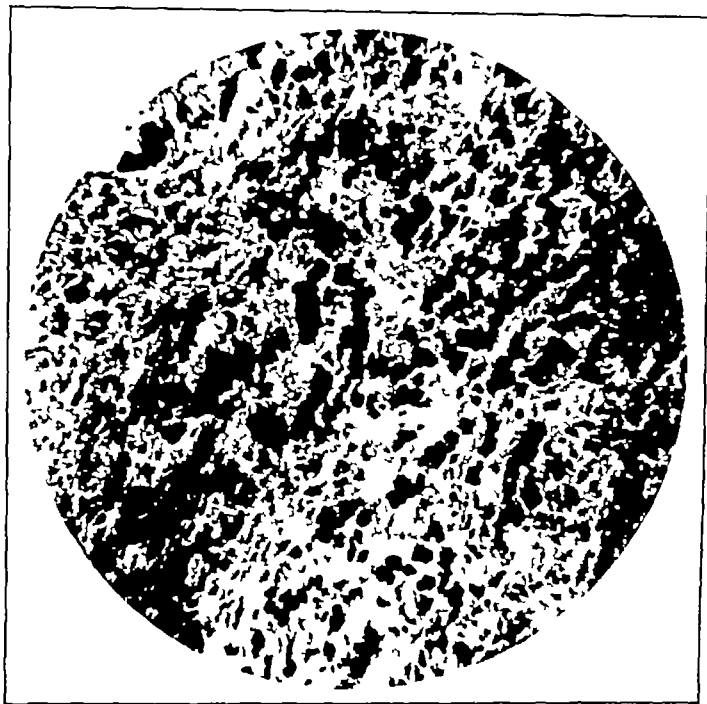


FIG 3

Photomicrograph of a section of the soft tumor, showing the black discoloration. The tumor was formed of polymorphous elements, epithelial in appearance, the nuclei were rarely in mitosis, quite regularly formed, and surrounded by a cytoplasm more or less colored by the melanotic pigment.

remain benign for a long time. One sees, says Delbet, some naevocarcinomata even smaller than the smallest of those which Ravaut showed to the Société de Chirurgie de Paris on February 2, 1927, which come under this generalization, for there are lymphophilic naevocarcinomata and hemophilic naevocarcinomata, and for the treatment of the former nothing is effective. On the other hand, relatively large tumors are seen which become cured after surgical removal.

Ought one to believe that the surgical removal of a naevocarcinoma does facilitate metastasis? It seems that this should be considered in reference to the primary tumor. A simple extirpation of the tumor seems to be the worst of all forms of therapy, for, following this procedure, it is usual to see a relapse of the mass around the periphery of the operative cicatrix, involvement of the glands, and the appearance of metastatic swollen nodules in widely separated regions, as if the operation, liberating the virulent neoplastic organism, must produce a cancerous generalization comparable to a septicæmia which sometimes follows the removal of certain inflammatory foci (Dr Chauvenet and Dr E. Dubreuil). In the treatment of these naevocarcinomata, then, surgery must yield to electrocoagulation, which destroys the tumor in a few seconds, blocking all the exits and preventing metastasis.

Should one blame the surgical removal for having increased in the case reported the localization of the secondary tumor? This is difficult to answer, for, according to the advice of the physician who treated this case, the small primary tumor had no appearance of malignancy.

One of the most instructive facts is the long interval of survival of the patient after the amputation of the thigh, in spite of the presence of many glands in the Scarpa's triangle, which had apparently diminished in size.

This proves that the prognosis in regard to these osseous tumors of metastatic origin is not always fatal within a short time. To refuse in a like case all therapeutic measures would be unjust to the patient, for a surgical removal might possibly lead to lasting success.

A METHOD OF APPLYING TRACTION IN T AND Y FRACTURES OF THE HUMERUS

BY ROBERT F. PATTERSON, M.D., KNOXVILLE, TENNESSEE

Since open operation leaves so much scar tissue and, as a rule, gives no better results than conservative closed methods, an effective means of applying traction to the region of the olecranon is very useful. In cases of T and Y fractures, traction on the axis of the humerus, either with or without lateral pressure over the condyles, is usually indicated.

The following method is simple and effective, and does away with the necessity of piercing the olecranon with a wire for traction.

TECHNIQUE

The elbow is flexed to a right angle and traction is exerted against the forearm. An effort is made to mold the fragments into position. While the arm is held in the flexed position by an assistant, a cast is applied from below the axilla to the fingers. The forearm is well padded on the anterior surface, especially near the elbow, to absorb the pressure exerted against this surface by the subsequent traction.

While the cast is hardening, the fragments are pushed together through the cast, and held in place by the indentations. A Kirschner wire is then inserted through the cast just over the olecranon and about one and one-half inches distal to the tip of the process. A loop is then attached to the wire for traction.

If a loop, such as that of Kirschner, is not available, a simple and effective loop can be quickly made by cutting the wires of a clothes hanger about three inches on each side of the hook and bending the ends to form a loop around each end of the wire in the cast. These loops are fastened to the wire close to the cast by adhesive. Additional adhesive is carried from the wire on each side around the cast in front to act as counterextension to prevent the wire from bending. All the weight necessary can be attached to such an appliance.

The patient is placed in bed with the flexed arm pointing upward, abducted to 90 degrees, and tied to an overhead frame just clearing the bed. To exert counterextension, a swathe is placed around the patient's chest and fastened to the opposite side of the bed. The proper amount of weight for traction is then attached. The same method of traction is also useful in treating fractures of the shaft of the humerus.

This method has been used by the author in two cases, in both of which the results were superior to any that he has been able to obtain by open operation. A report of the first of these two cases follows.

John L., aged thirteen years, fell from a tree on July 11, 1934, and suffered a comminuted fracture of the lower ends of the right humerus and radius. Under general

anesthesia, the fracture of the wrist was set and a cast was applied to below the elbow. The condylar fracture was then reduced in the manner described.

The roentgenogram taken previous to reduction showed a long, oblique fracture of the inner condyle running into the joint near the middle, with one and one-fourth inches of the upper end of the fragment detached and lying obliquely across the shaft. There was a comminuted appearance of the rest of the bone above the joint, with a distinct line running to the outer border. The inner condyle was greatly displaced and there was marked deformity. There was also a completely displaced fracture of the shaft of the radius just above the wrist.

The patient was treated in the hospital for two weeks with traction by means of the apparatus described. The cast was removed on August 8, 1934, and physiotherapy was given until September 13 when he was discharged.

Examination on October 29, 1934 showed range of motion as follows: angle of greatest flexion, about 30 degrees, the same as that of the other arm; angle of greatest extension, about 160 degrees; pronation and supination, normal. The arm was painless and strong. The carrying angle was normal. Figure 1 shows the good anatomical reduction secured.



FIG 1

Roentgenograms of right elbow, taken October 29, 1934, showing good anatomical reposition of the fragments and the preservation of the carrying angle. The wide range of motion now present is also indicated. Note the posterior projection of bone and the remains of the detached fragment firmly united to the shaft, with its margin undergoing absorption.

EXCEPTIONAL CASE OF UNDIFFERENTIATED SARCOMA OF THE HUMERUS

BY HENRY BASCOM THOMAS, M D , CHICAGO, ILLINOIS

From the Department of Orthopaedic Surgery, University of Illinois, College of Medicine, and St Luke's Hospital, Chicago

This case is of interest not only because of the advanced age at which the tumor developed (fifty-eight years), but also because the patient is alive and well nine years (January 25, 1935) after resection of the proximal third of the humerus, whereas the life of a patient with a malignant bone tumor is usually considered to be five years at best

This tumor has been classified as an undifferentiated sarcoma The author has been advised that there are only two such cases registered with the American College of Surgeons, one of which is this case bearing registry number 1523 The other patient died within three months after resection Dr Codman writes "The x-ray is typical of metastasis from cancer, the photo of the gross specimen is typical of osteogenic sarcoma, the slide shows a malignant tumor, the history shows that it was probably benign I don't know what to make of it The result is certainly most gratifying and the registration of the case will give hope for the hopeless" Dr Bloodgood gives a diagnosis of round-cell sarcoma,



FIG 1

Right shoulder, January 9 1926 Notice large punched-out area in greater tuberosity, with destruction of cortex

resembling lymphosarcoma or leukosarcoma, which practically agrees with the classification of undifferentiated sarcoma

CASE REPORT

A married woman, aged fifty-eight, entered the author's service at St. Luke's Hospital on January 15, 1926, complaining of severe pain and swelling in the right shoulder. Three weeks previous to admission, she had fallen on icy ground and had struck her right shoulder against a fence. Swelling was limited to the area of the shoulder. Considerable pain followed and soon she was unable to extend or abduct her arm. The history was otherwise irrelevant.

No pain, swelling, effusion, or deformity was evident in any region except the right shoulder. The right arm was held slightly abducted. The head of the humerus appeared to be enlarged on palpation, and pressure caused dull, subacute pain in this region. The arm could not be abducted voluntarily beyond 60 degrees, while further abduction by passive motion was painful; it could be raised forward and slightly rotated without appreciable pain.

An x-ray (Fig. 1) was taken on January 9, 1926, before hospitalization and a diagnosis of fracture of the humerus and periosteal tumor was made.

A roentgenogram, taken on January 25, showed a fracture through the surgical neck of the right humerus, with the fragments in good position. There was a good deal of periosteal proliferation along the shaft of the proximal third. There were multi-



FIG 2

Excised tumor, showing destruction of cortex at the posterior and lateral surfaces of the humerus

ple areas of bone destruction, with some involvement of the cortex, immediately distal to the greater tuberosity. Between these areas of destruction, there was some condensation of bone. The articular surfaces were intact. There was some rarefaction involving the medullary portion of the distal half of the humerus, probably due to atrophy of disuse. The fact that the articular surface was uninvolved points toward a malig-

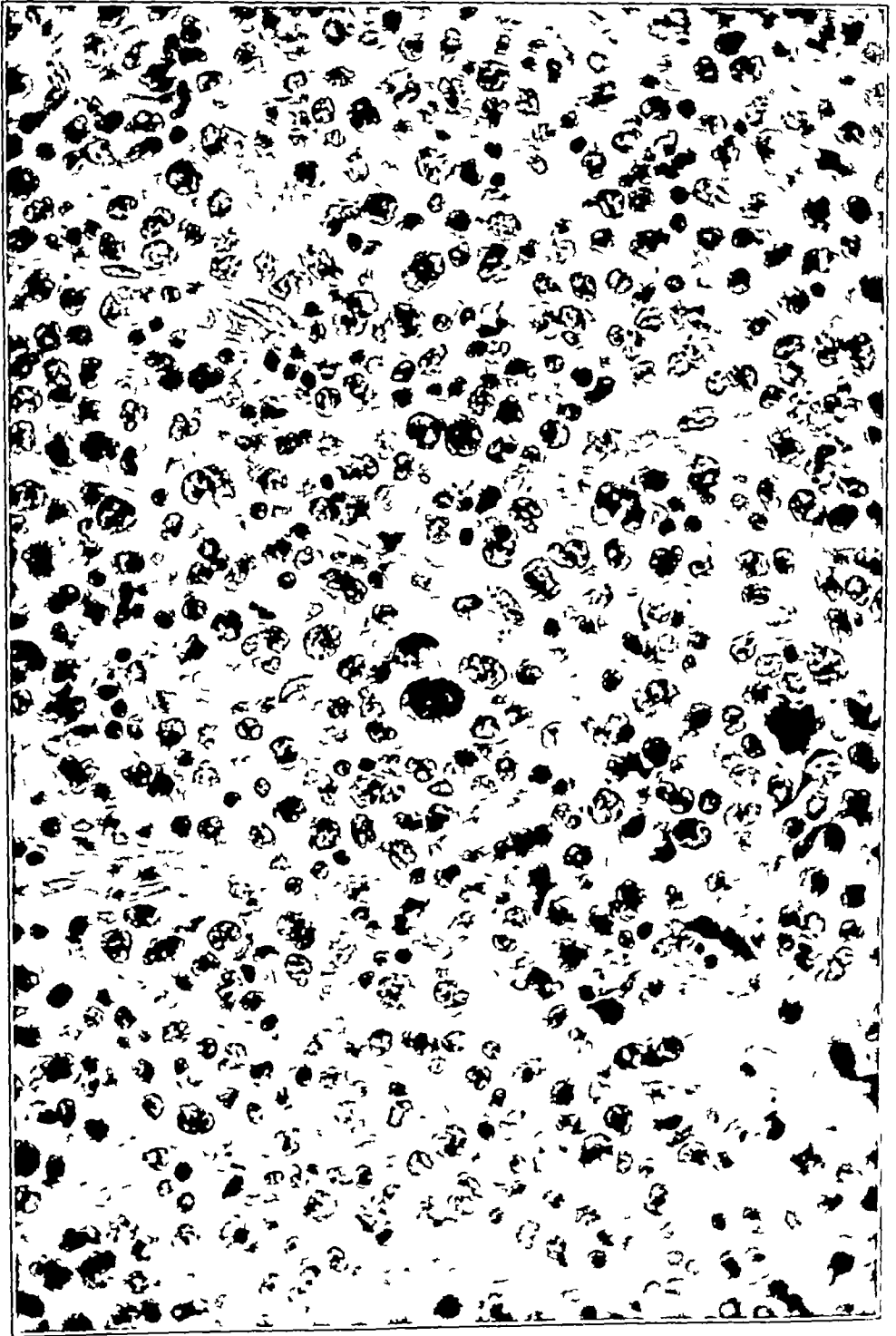


FIG 3



FIG 4

Roentgenogram showing remains of the humerus upper third resected bone drawn high on account of contracted muscles

nancy. The presence of a fracture, which was probably pathological, also speaks for a malignancy.

Dr Bloodgood saw this patient in consultation with the author and advised immediate operation. Consequently, on January 25, 1926, a resection of the proximal third of the right humerus was done (Fig 2). The patient refused a fibular transplant to replace the humeral head.

The pathology was reported as round-cell sarcoma of the humerus, and the histology as "Highly cellular tissue composed chiefly of round cells, medium in size with very little fibrous tissue stroma in which are small capillaries. The nuclei of the cells are bean-shaped, oval or round, and vesicular. The amount of cytoplasm is scanty. A few mitotic figures are found in the sections." (See Figure 3.)

The patient did not return for observation until 1930, four years after the operation. At this time, the muscle power was great enough to pull the free end of the humerus up



FIG 5

Photograph seven years after resection of the upper third of the humerus, showing the amount of flexion of the arm on the forearm when the arm is held close to the body.

to the glenoid cavity, but, when relaxed, the proximal end of the humerus descended six inches below the cavity. Motion of the arm was limited. There was no evidence of recurrence of the tumor. By holding the arm close to the chest, the patient was able to use it fairly well.

In May 1932, the patient was seen at her home. She was doing her own work (including the washing) and, with the exception of a skin ulcer on her leg, seemed to be in good health. As a photograph (Fig. 5) taken about six months later shows, she is still able to use the arm fairly well. However, she has a very flabby, unstable upper arm, giving not nearly the function that is obtained when a similar operation is completed by a fibular transplant.

On August 24, 1933, roentgenograms of the shoulder, skull, and pelvis were negative.

SUMMARY

The outstanding features of this case are as follows:

- 1 Onset of the tumor at the age of fifty-eight
- 2 Trauma antecedent to the onset of the tumor
- 3 Presence of pathological fracture, symptomatic of weak periosteal reaction
- 4 Intactness of the articular surfaces, characteristic of osteogenic tumor
- 5 Typical destruction of cortex in one portion of the bone
- 6 Histological examination of the involved bone showing irregular decalcification, break in cortex, invasion, and condensation
- 7 Postoperative survival of nine years (January 25, 1935) and no noticeable signs of metastases

FRACTURE OF THE CAPITELLUM

A REPORT OF A CASE

BY M S MAZEL, M D , CHICAGO, ILLINOIS

Fracture of the capitellum is so rare that to date only thirty cases have been reported in the literature. Most of these have been found not to be true cases of fracture of the capitellum itself; the fracture of the capitellum has usually been associated with other fractures around the elbow joint. A report of a recent case and a brief review of the literature on the subject will not be out of place.

This review does not deal with T or Y fractures of the humerus, fractures of the external or internal condyle, fracture of the trochlea, or fracture of the capitellum associated with fractures of the head of the radius or ulna, but specifically with *fracture of the capitellum itself*.

Up to the present time, the exact mechanism of the fracture is not definitely known except that trauma plays the major role and the force is extended through a partially flexed or extended forearm in such a way that the force exerted through the head of the radius or humerus partially locks the capitellum, splitting it off of the humerus. This probably occurs most often when the heads of the radius and capitellum are most closely and completely in contact in the position of semiflexion and semi-pronation. The lesion consists of a gouging out or splitting off of the anterior articular surface of the external condyle of the humerus, the face of which articulates with the head of the radius, taking with it a strip of the underlying bone.

Several authors have attempted to produce this fracture experimentally. The fracture is intra-articular, has no firm attachments, and lies free in the joint. It is almost always displaced anteriorly, but may be displaced posteriorly, as reported by Kocher and Lorenz. This fracture was first described by Kocher. The fragments in three of his cases were displaced posteriorly, but within the joint capsule. Most authors like Cotton, Gejrot, and others believe that in the majority of cases the fragments are displaced anteriorly. In the case to be reported the fragment was displaced anteriorly. The fragment usually comprises the capitellum with a portion of the trochlea. The x-ray examination does not always reveal this and, unless an operation is performed in these cases and the fragment is examined, the true nature of the fracture will be missed.

SYMPTOMS

The symptoms depend upon the degree of trauma and the size of the fragment. Essentially they are as follows:

1. Limitation of motion in the elbow joint following an injury, perhaps with serious interference with flexion or extension.
2. Crepitation on motion.

- 3 Tenderness and swelling at the bend of the elbow
- 4 Preservation of the three points of orientation of the elbow joint
- 5 Palpation of the fragment usually above and in front of the external condyle, but occasionally below and behind it
- 6 Considerable disability out of all proportion to the amount of external signs of injury

The diagnosis is easily made by means of the x-ray, and this may be the only means of making an accurate diagnosis. This type of fracture is best seen in the lateral view, and is characterized by the line of fracture through the capitellum and the upward displacement of the detached fragment into the coronoid fossa, with the fractured surface facing the anterior surface of the humerus. The anteroposterior view gives one very little evidence of the fracture unless it is observed very closely and then the lower outline of the capitellum and the contours of the fragment may be seen.

The fragment usually does not unite and acts as a wedge in the joint, seriously interfering with the function of the joint. The fragment may continue to grow, to throw out excessive callus, and to produce more or less ankylosis of the joint.

TREATMENT

The treatment is essentially surgical and the best results reported are those in cases which have been treated by extirpation of the fragment.

Since most writers had recommended extirpation, the author was anxious to see what could be done by conservative measures,—a careful reduction of the fragment and rechecking of the position by x-rays. The results are shown in the following case report.

CASE REPORT

Miss M. N., aged twenty-three, was admitted on the author's service at the Edgewater Hospital on March 7, 1934, complaining of pain in the left arm, with limitation of motion at the elbow joint.

The patient was an entertainer and, at the time of the injury, she was rehearsing a dance with a group of girls. In jumping over the leg of one of her companions, she fell. Her left elbow was in a position of acute flexion and semipronation, with her left hand resting against the lower part of the left jaw, so that she struck the lower end of the humerus against the floor. She remembered distinctly that she fell so rapidly that she had no time to break her fall by extending the elbow, but struck the back of her elbow and face on the floor of the stage. Her director at first thought she had suffered a dislocation of the elbow, because she was unable to flex or to extend the forearm, and several attempts were made to reduce the dislocation. When the disability persisted, she was sent to the author for further treatment.

Examination disclosed a definite swelling about the elbow joint, flexion and extension were absolutely impossible, the elbow being held at a right angle. There was no discoloration of the tissues and the elbow landmarks were intact. A fragment could be felt over the anterior surface of the humerus.

To determine the extent of the injury an x-ray was taken, which revealed the fractured capitellum.

The patient was given nitrous oxide anesthesia and the fragment was completely reduced, while another x-ray was taken to check the reduction. The patient was kept

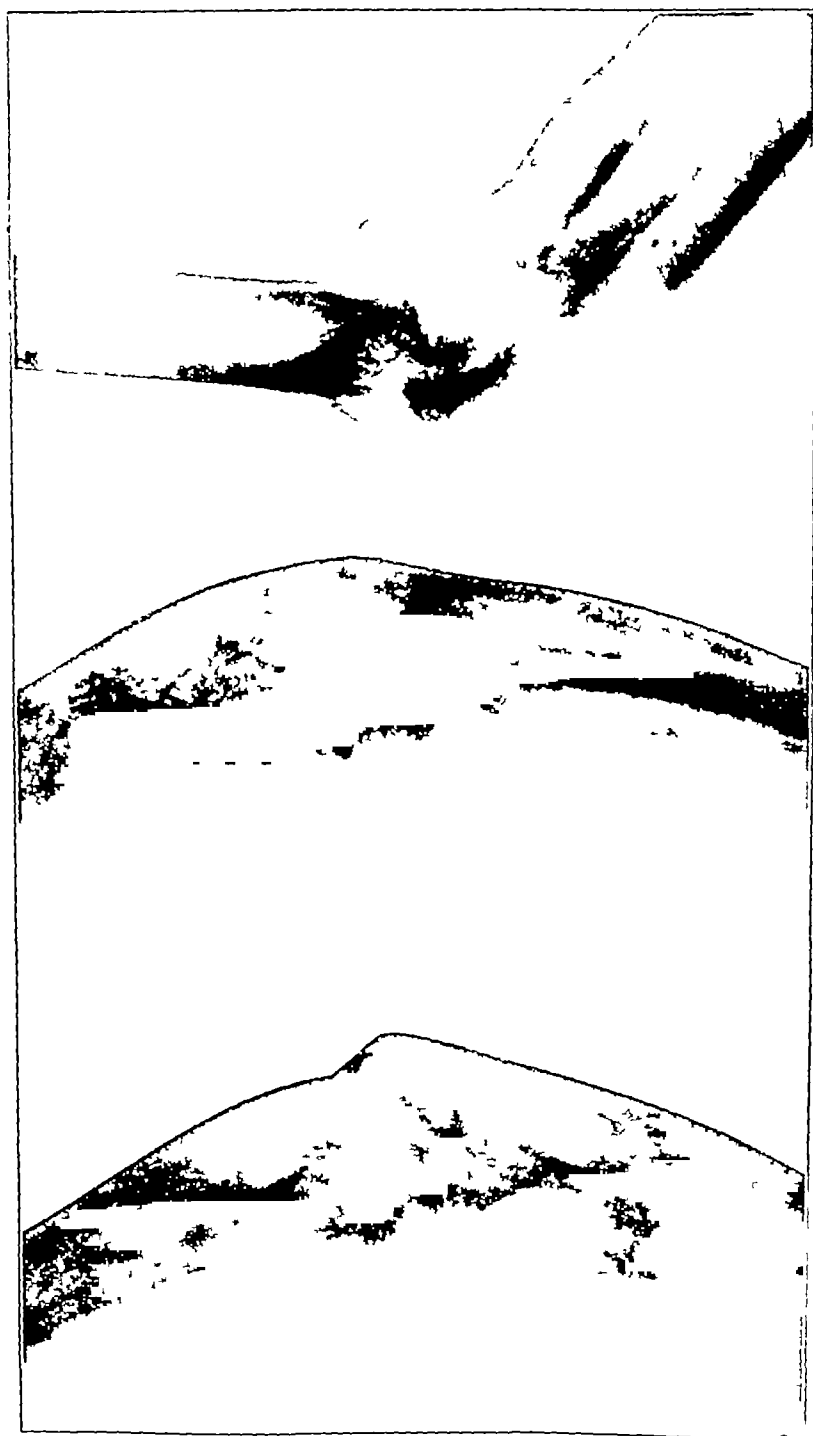


FIG. 1
Roentgenograms demonstrating fracture of left capitellum before reduction



FIG 2

Roentgenogram after removal of fragment, demonstrating perfect clinical reduction

under the anaesthetic and, in spite of the fact that the subsequent X-rays showed a perfect reduction, limitation of flexion was noted and rotation of the forearm was partially interfered with

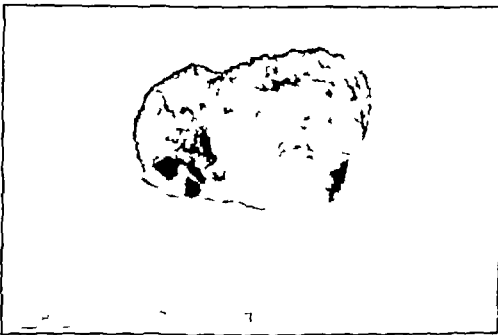


FIG 3

Capitellum removed, showing articular surface with part of trochlea

A light posterior splint was applied and the following morning the patient was operated upon. A tourniquet was applied about the middle of the left arm and a lateral incision about two inches long was made over the head of the radius. The soft tissues were separated with blunt dissection and held aside with retractors. The joint was opened and the fragment of bone was removed. When the joint was opened, the fragment was found to be in perfect position, yet limitation of motion was present. Only after the fragment of bone had been removed was complete range of motion restored to the joint. The blood was removed from the joint cavity with a moist saline sponge; the joint capsule was closed with fine catgut and the skin with interrupted linen sutures. A silkworm skin drain was inserted at the lower angle of the wound and the arm was immobilized in the position of flexion.

The sutures were removed after six days and the cast after twelve days. Passive movements were then begun, followed by baking and massage. After three weeks the

patient had regained almost complete function of the arm and, after the fourth week, she returned to her position on the stage

CONCLUSIONS

1 Fracture of the capitellum itself is very rare and is produced by a fall or blow on a slightly flexed or extended elbow in such a way that the head of the radius locks with the capitellum, splitting it from its attachment to the humerus

2 The diagnosis is determined by a history of injury to the elbow with limitation of motion out of all proportion to the physical signs of injury. There is no disturbance of the elbow landmarks. Crepitation and the palpation of a fragment in the fossa can usually be made out. The x-ray, especially the lateral view, demonstrates the fracture line and the usual upward and forward displacement of the fragment

3 The best treatment is extirpation of the fragment. No attempt should be made to treat such cases conservatively, as the results are almost always disabling, while in those cases treated surgically excellent results are obtained

DISCUSSION

In this particular case, in spite of the perfect reduction shown by the follow-up x-ray and at operation, the question arises as to the cause of the disability

The answer to this question was found very quickly when the fragment was examined. As previously mentioned, every fractured capitellum has a layer of bone attached to its articular surface, with a portion of the trochlea. This fragment can be replaced, but never fits accurately into its bed. Consequently, the radius, which normally glides over the capitellum and only comes in direct contact with the articular surface in the position of acute flexion of the elbow (*Cunningham's Anatomy*), now comes into greater contact during extension of the elbow, thereby not only interfering with flexion and, to a certain degree, extension, but also with rotation of the radius. Then, if allowed to heal by conservative measures, when union takes place and callus forms the result is still more disabling. The use of too great a pressure in attempting a conservative reduction only tends to break up the fragment and may leave small particles of bone in the joint, which may seriously damage the joint and which, in all probability, will be missed by the surgeon when extirpation of the fragment later becomes imperative for the restoration of proper function of the elbow joint

BIBLIOGRAPHY

- ASHHURST, A. P. C. *An Anatomical and Surgical Study of Fractures of the Lower End of the Humerus*. Philadelphia, Lea & Febiger, 1910
- COTTON, F. J. Two Unusual Forms of Fracture—Fracture of the Capitellum, Fracture of the Fifth Metatarsal by Inversion. *Boston Med. and Surg. J.*, CXLIX, 734, 1903
- CUNNINGHAM'S ANATOMY *Anatomy of the Elbow Joint*. Ed 4, p 236. New York, William Wood & Company, 1914

- DARRACH, WILLIAM Open Reduction of Fracture of the Capitellum *Ann Surg*, LXIII, 487, 1916
- FLINT, CARLETON Quoted by Lewis A Stimson in *A Practical Treatise on Fractures and Dislocations* Ed 8, p 292 Philadelphia, Lea & Febiger, 1917
- GEJROT, W On Intra-Articular Fractures of the Capitellum and Trochlea of the Humerus with Special Reference to the Treatment *Acta Chir Scandinavica*, LXXI, 253, 1932
- HOPKINS, F S Fracture of the Capitellum *New England J Med*, CCVI, 1261, 1932
- KOCHER, THEODOR Beiträge zur Kenntniss einiger praktisch wichtiger Fracturformen (Mittheil a Klin u med Inst d Schweiz, III Reihe, Hefte 10, 11, 12, 585-891) Basel, Carl Sallmann, 1896
- LINDEM, M C Fractures of the Capitellum and Trochlea *Ann Surg*, LXXVI, 78, 1922
- LORENZ, HANS Zur Kenntniss der Fractura Capituli Humeri (Eminentiae Capitatae) *Deutsche Ztschr f Chir*, LXXVIII, 531, 1905
- MILCH, HENRY Unusual Fractures of the Capitulum Humeri and the Capitulum Radii *J Bone and Joint Surg*, XIII, 882, Oct 1931
- ROBERTSON, R C, AND BOGART, F B Fracture of the Capitellum and Trochlea, Combined with Fracture of the External Humeral Condyle *J Bone and Joint Surg*, XV, 206, Jan 1933
- WILMS, M *In Chirurgie der Extremitäten Handbuch der praktischen Chirurgie*, 2 Aufl, IV, S 194 Stuttgart, Ferdinand Enke, 1903

CONSERVATIVE TREATMENT OF FRACTURE OF THE CAPITELLUM

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AND L F BUSHNELL, M D , EVANSTON, ILLINOIS

In view of the general opinion that operative reduction gives the best results in the treatment of fracture of the capitellum, the following two cases, in which excellent results followed closed reduction, will be of interest

CASE 1 Mrs A R , aged forty, sustained a fracture of the left capitellum on March 12, 1932 She was immediately taken to the Evanston Hospital where, under



FIG 1

Case 1 Fracture of the capitellum (lateral condyle) of the humerus

A Before reduction B After reduction by hyperextension of the elbow with pressure upon fragment At the end of four weeks 95 per cent of function had been restored (Courtesy of W B Saunders Company)

anaesthesia, a reduction was effected by manipulation (F C) Figure 1 shows the position of the fragment before and after reduction The elbow was maintained in hyperflexion by adhesive, and the angle was rapidly increased until April 2, 1932, when the adhesive was removed

Twenty-eight days after the injury motion was practically complete

Two years and three months after the injury there was perfect motion and no pain The x-ray appearance (Figs 2-A and 2-B) was normal

CASE 2 Miss F B , aged thirty-eight, sustained a fracture of the left capitellum on

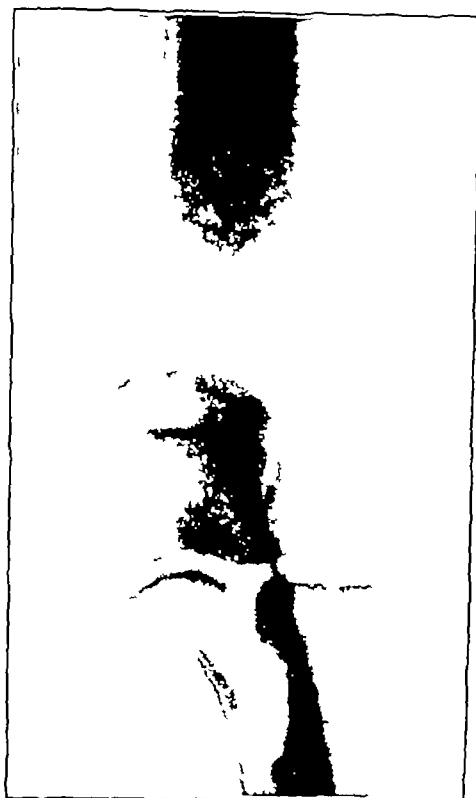


FIG 2-A

FIG 2-B

Case 1 Two years and three months after injury

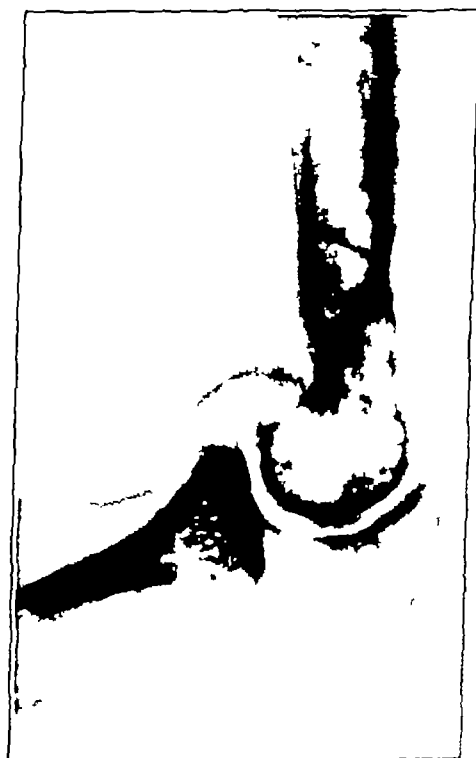


FIG 3-A

FIG 3-B

Case 2 Before reduction

June 19, 1934 (See Figures 3-A and 3-B) She was taken to the Evans-ton Hospital immediately and anaesthetized. Several efforts (F C) to reduce the fracture were unsuccessful. One of us (L F B) then applied traction to the supinated forearm, which was flexed to 90 degrees, and at the same time applied pressure over the fragment. Following this manoeuvre, reduction was obtained (See Figure 4). A molded plaster posterior splint was applied for four days.

Twenty days after the injury there was no pain and 90 per cent of motion had returned.

When last seen on December 13, 1934 (Figs

5-A and 5-B) the patient said that she had "no pain at all." There was no tenderness. Flexion, extension, supination, and pronation were full and complete. She said that the affected arm (the left) was still not quite as strong as the other arm.

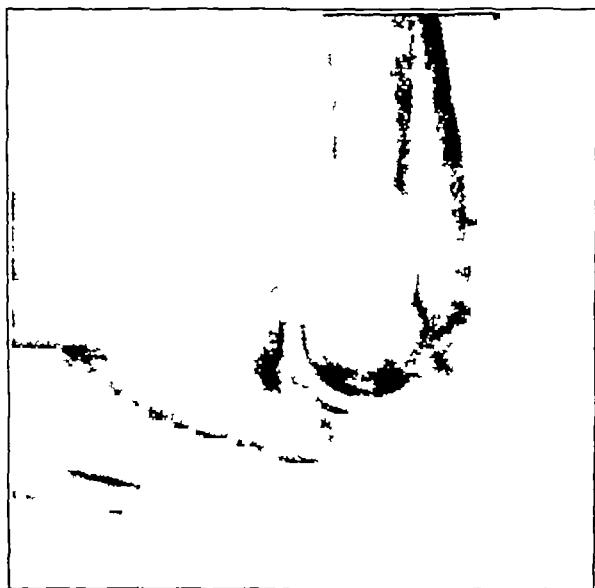


FIG 4

Case 2 After reduction. The extremity is incorporated in a molded plaster-of-Paris splint.

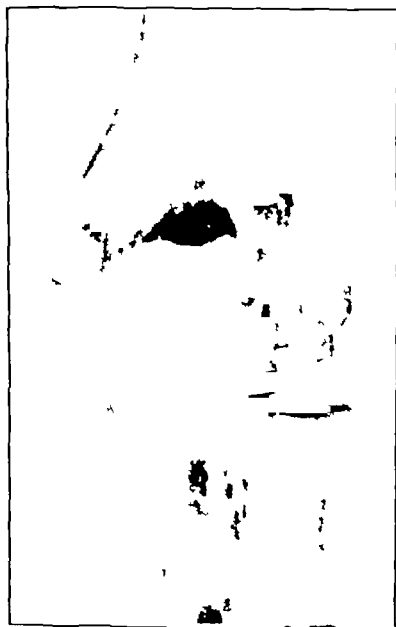


FIG 5-A



FIG 5-B

Case 2 December 13, 1934 The fracture is not even recognizable.

Fracture of the capitellum is suspected after an injury involving the elbow when there is pain, localized tenderness, limited motion, and swelling. The diagnosis is confirmed by x-ray. In the treatment of this condition Lee and Summey say that "surgery is the only treatment that offers satisfactory results." Cotton states that "the only treatment is an excision of the fragment." Of course, if manipulative reduction is impossible, operative removal of the intra capsular fragment is necessary. If the fragment is not removed and if reduction is not obtained, a poor result, even ankylosis, will follow.

In view of the splendid results obtained in the two cases reported, the writers feel that in such cases every effort should be made to obtain a reduction by manipulation, especially employing the method used by one of us (L F B) in the second case.

BIBLIOGRAPHY

- CHRISTOPHER, FREDERICK Minor Surgery Ed 2, p 571 Philadelphia, W B Saunders Company, 1932
- COTTON, F J Dislocations and Joint-Fractures Ed 2, p 287 Philadelphia, W B Saunders Company, 1924
- HAHN Fall von einer besonderen Varietät der Fracturen des Ellenbogens Ztschr f Wundärzte u Geburtshelfer, VI, 185, 1853
- JOPSON, J H Fracture of the Capitellum Internat Clin, Series 24, IV, 232 Philadelphia, J B Lippincott Company, 1914
- LEE, W E, AND SUMMEY, T J Fracture of the Capitellum of the Humerus Ann Surg, XCIX, 497, 1934

TORTICOLLIS DUE TO THE ABERRANT STERNAL PORTION OF THE STERNOCLEIDOMASTOID MUSCLE

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A case of true congenital torticollis is here presented. A search of the Quarterly Cumulative Index and the Surgeon General's Index fails to reveal any mention of this particular condition in English medical literature. Standard text-books of anatomy—Gray, Cunningham, Piersol, Morris, and Spalteholz—also fail to mention this condition.

A four-year-old boy was admitted to the State Crippled Children's Service at University Hospitals, Columbia, Missouri, on December 4, 1934, complaining of left torticollis. On examination, the head was held in typical position,—bent forward with the left ear pulled down toward the left clavicle. It was noted that the deformity was much more marked than is usually seen. It was impossible to correct the head and to throw into any degree of prominence the sternomastoid muscle on the left side.

At operation the following day, an anomaly of the sternomastoid was seen in that the sternal portion of the muscle was attached to the right clavicle, in addition to its normal attachment to the left clavicle. The muscle crossed the mid-line as a dense muscle band about 1/4 inch wide and one-fourth of an inch thick, and was very definitely attached to an inch of the sternal end of the right clavicle. Upon division of these fibers, the deformity

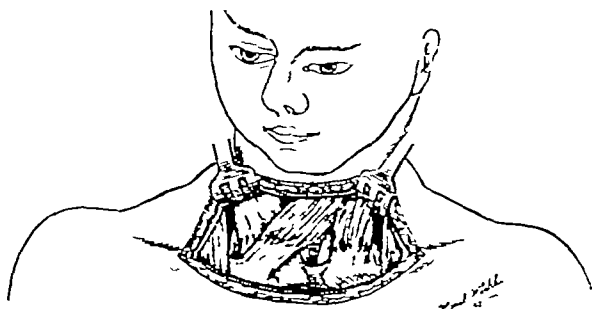


FIG 1

Diagrammatic representation of the position of the chin, the normal and the aberrant sternal heads of the left sternocleidomastoid muscle.

was readily corrected and the head was brought around in definite overcorrection. No other portions of the muscle were involved in the production of this deformity. The incision over the left clavicle had to be extended across the mid-line to the other clavicle in order to demonstrate this abnormality.

A LIGHT INEXPENSIVE FRAME FOR TRANSFIXION-WIRE TRACTION ON FRACTURES OF THE FOREARM AND LEG

BY E W CLEARY, M D , SAN FRANCISCO, CALIFORNIA

Since Kirschner, Matthews, and others pioneered the field, many different machines have been devised for facilitating traction by small wire under tension. Mechanical complexity, cumbersome, and cost are factors which should be minimized in such a machine. With these considerations in mind, the author has devised the frame assembly here described and has used it in treating his patients with a gratifying measure of success and satisfaction.

This machine seems to fulfil the desiderata in such a device. It is as light as is compatible with sustaining the stresses of adequate traction and countertraction. It permits easy application of casts and dressings and does not seriously interfere with fluoroscopy or the taking of x-rays.

Various parts of this machine are made from standard sizes of Bessemer steel rods and cold rolled steel bars with a minimum of machining and

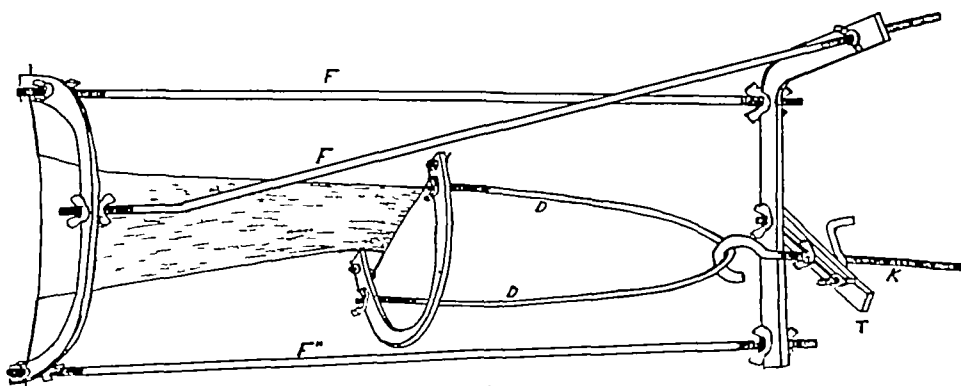


FIG 1-A
Traction frame

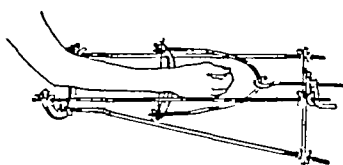


FIG 1-B
Frame applied to fracture
of the forearm

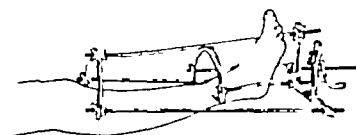


FIG 1-C
Frame applied to fracture
of the leg

tooling. Standard size tap screws and wing nuts have been utilized. The result is the production, at a very low cost for material and labor, of a finished machine consisting of a few simple and easily replaceable parts.

A wide range of adaptability is secured by long threads and wing nuts on the bars, F , F' , F'' , and the bridle, D , of the free distal stirrup (Fig 1-A). This stirrup rotates freely and any position of rotation may be

held by tightening the lock nut against the slotted post *T* (It should be noted that in fractures of the forearm the proximal wire is always put through the ulna only and the distal wire through the radius only) The post *T* permits adjustment of the traction screw *K* anywhere along a three-inch slot The single bolt by which the post is attached to the frame allows the traction screw to be swung to either side, thus providing liberal lateral adjustment The stirrups stand perpendicular to the long axis of the limb under traction and are thus out of the way in applying plaster or dressings

The length of the base bars, *F* and *F''*, is twenty-four inches, that of the diagonal bar, *F'*, twenty-six inches These bars and the traction screw are one-quarter of an inch in diameter The stirrups and the distal end bar are of steel, one-quarter of an inch by three-eighths of an inch The span of the proximal stirrup is seven and one-half inches, of the distal stirrup, six inches The bridle is three-sixteenths of an inch in diameter The slotted post *T* is of steel, one-quarter of an inch by three-quarters of an inch

The entire frame is readily sterilized and may be completely taken

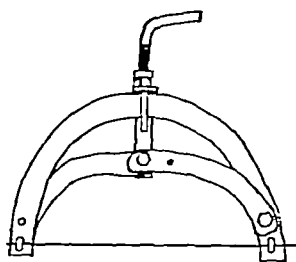


FIG 2-A
Stirrup and compressor
tongs

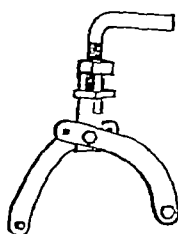


FIG 2-B
Compressor tongs

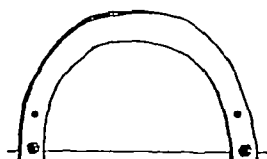


FIG 2-C
Stirrup tightened on
wire and tongs re-
moved.



FIG 2-D

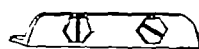


FIG 2-E

Retaining clamps

apart or assembled in five minutes or less Ordinarily, it is necessary to have only the transfixion wires and the drill sterilized

When the wires have been placed and dressings have been applied over the points where they pierce the skin, the requirements of asepsis have been fulfilled The compressor tongs are then applied to the larger stirrup, as shown in Figure 2-A The wire-lock bolts on this stirrup are tightened over the proximal wire and the tongs removed The arms of the tongs are then shortened and the smaller stirrup (Fig 2-C) is compressed and applied to the distal wire The bars, *F*, *F'*, *F''* are attached to the L-shaped base bar and then to the proximal stirrup, which thus

becomes the proximal transverse element of the frame (Figure 1-A illustrates how utilization of the principle of three-point suspension by means of the three slender bars secures rigidity with accessibility and lightness) The bridle is put on the distal stirrup and hooked up to the traction screw, which is tightened gradually When the distal wire passes through the os calcis, a short bridle (not illustrated) is used

During the application of traction, adjustments of the frame, bars, bridle, or traction post are made as necessary in order to perfect alignment of the fractured bones When overriding has been overcome, the traction screw is locked in the desired position of rotation Plaster may then be applied or traction continued in the frame

When plaster has been applied, the wire-retaining clamps (Fig 2-D) may be put on at once and their bearing surfaces may be made snug against the cast by applying bits cut from a plaster bandage and moistened When the cast has hardened sufficiently to bear the considerable stress of the tensed wires, the frame is taken apart, the stirrups taken off, and the ends of the wires cut short up to the retaining clamps

The technique described accomplishes a maximum degree of control of the fracture and reduces necessary hospitalization to a minimum This frame can be assembled at a cost of considerably less than forty dollars

A MODIFICATION OF THE BÖHLER WALKING IRON

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The apparatus here described is felt by the writer and others to have definite advantages over the walking iron which is in common use

A solid, round, steel peg, one and one-eighth inches long by thirteen-sixteenths of an inch in diameter is riveted to the regular iron, as described by Böhrer¹ The peg corresponds in size to the inside length and diameter of an ordinary rubber crutch-tip The iron is bent in the usual manner to fit the contour of the ankle and leg, and the rubber tip applied

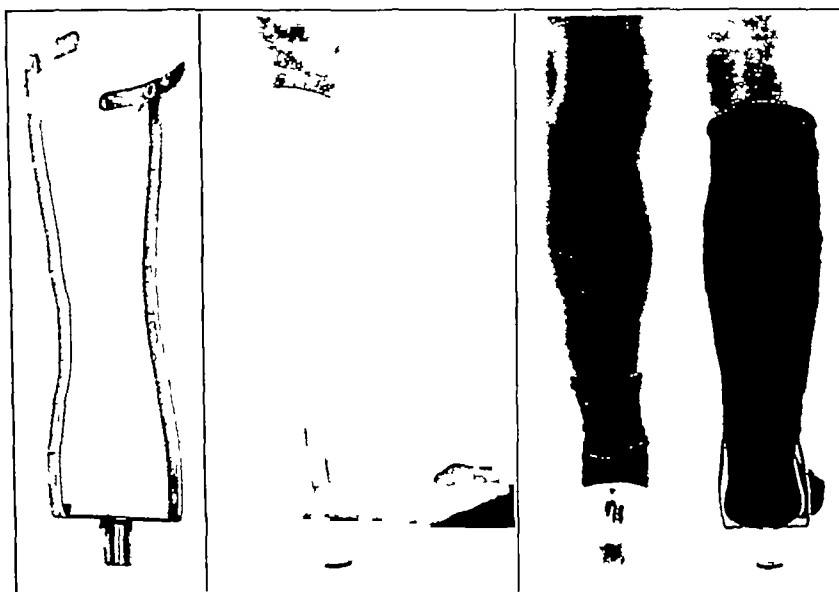


Fig 1

Bent iron with
peg attached

Fig 2

Walking iron applied,
lateral view

Fig 3

Walking iron applied,
posterior view

Certain differences in the application of this iron must be observed Because of the added distance from the heel of the boot to the floor (approximately one and one-quarter inches), it is necessary to place the cross-bar of the iron almost in contact with the sole of the boot By so doing, the tip corresponds to the height of the heel worn on the opposite shoe It is also important that the peg be placed under the center of weight-bearing If it is placed medial to this point, the knee is thrown into varus, with resultant strain The reverse holds true if the peg is placed too far laterally

This apparatus has the advantage of giving the patient a small point on which to pivot in walking. It allows the patient to walk about on smooth or slippery floors without damage to the floor by the iron, or danger of injury to himself through falling. The iron is less cumbersome, as it does not protrude beyond the sole of the boot. It allows one to walk on wet or icy streets with more assurance. The added cost is practically negligible.

This modification has been in use for the past year at the Massachusetts General Hospital, almost to the exclusion of the old type of walking iron and to the complete satisfaction of both the patients and surgeons.

- 1 BOHLER, LORENZ. Die Technik Der Knochenbruchbehandlung. 3 Aufl., S. 69. Vienna, Wilhelm Maudrich, 1932.

SKELETAL BLASTOMYCOSIS

A CASE REPORT

BY S K LIVINGSTON, M D , F A C S , HINES, ILLINOIS

The term "blastomycosis" has been applied to all suppurative granulomatous processes affecting the skin and internal structures, due to yeastlike fungi. The term is more correctly applied to cases characterized by the presence of granulomatous, verrucoid lesions in which fungi of the type *Blastomyces* are found. These fungi may be considered to be of the genera *Saccharomyces*, *Cryptococcus*, *Coccidioides*, *Oridium*, and *Monilia*. Stoddard, Cutler, McNeal, and Taylor are, however, of the opinion that "blastomycosis and coccidioidal granuloma are distinct clinically, pathologically, and biologically."

Since Rypins, in reporting three cases of skeletal blastomycosis, has included a careful review of the twenty-nine cases previously recorded, with a comprehensive bibliography, no attempt will be made in this article to review the literature.

PATHOLOGY

The outstanding histological features are (1) a hyperplasia of epithelium reminding one of epithelioma, (2) small intra-epithelial abscesses, (3) a granulomatous appearance of the corium with collection of plasma cells, giant cells, small nodes, and abscesses, and (4) the abundant presence of the organism, especially in the giant cells and subepithelial abscesses. The sweat glands and hair follicles are imbedded in this granuloma which may extend to the muscular layer. The tuberculoid nodules present only small differences from those of tuberculosis, but giant cells are apt to contain parasites; caseation is rarer, and the endothelial zone is not apt to be well defined. The histological changes in internal organs greatly resemble miliary tuberculosis, but differ by the presence of numerous abscesses.

SYMPTOMS

In most cases, the disease is chronic and lasts for years. The cutaneous lesions may have periods of rapid progression, interrupted by periods of quiescence. They may exist for years without involvement of deeper parts. In the systemic cases, the signs and symptoms may be similar to those of tuberculosis and pyaemia.

The onset may be sudden with febrile disturbances and either symptoms of acute infection of the respiratory tract or signs of lesions in other parts. In other cases, the onset is insidious, and the first manifestation of the disease may be the local ulceration or abscesses.

After the systemic disease has been established, the symptoms are

malaise, loss of strength, emaciation, pain in the affected parts, irregular fever, rapid pulse, and occasional chills and sweating Explosive outbreaks of cutaneous lesions, associated with febrile reaction, may occur

Symptoms and signs of pulmonary involvement are commonly manifested,—coughing, hoarseness, dyspnoea, purulent or bloody sputum, pain in the chest, diminished chest expansion, dullness on percussion, râles and increased transmission of breath and voice sounds The fungi may be found in the sputum There may also be diarrhoea, oedema, and albumin and casts in the urine Pain is a prominent symptom of abscess formation, especially of abscesses which involve bone In lesions of the vertebrae, there may be paralysis and incontinence As in other chronic infections, there may be anaemia and leukocytosis

DIAGNOSIS

Blastomycosis should be considered in the cases of chronic pustular or ulcerative conditions of the skin, wasting pulmonary disease, spontaneous superficial and deep abscesses, especially those connected with bone, suppurative arthritis, and suspected tuberculosis of the spine The diseases with which it is most likely to be confounded are coccidioidal granuloma, epidermoid carcinoma, actinomycosis, tuberculosis, and syphilis

The diagnosis can be made with certainty only by finding the specific fungi in the lesions, in the discharges from them, or in the sputum In cases in which the lungs or bones are involved, the diagnosis may depend upon the recognition of the nature of any coexistent cutaneous lesions

TREATMENT

The accepted treatment includes iodides by mouth and intravenously Autogenous vaccines have been recommended by Christensen, Hektoen, and Stober Radiation therapy in bone and skin lesions should be attempted

The following report is presented to place on record one more case of skeletal blastomycosis

CASE REPORT

D E H, a white male, aged forty-one years, a farmer, was admitted to the Hospital on May 21, 1931, for treatment of ulcers of the face and legs

Chief Complaint Ulcers of face and legs, and spitting of blood

Family History Essentially negative

Past History The patient had had the usual diseases of childhood He stated that he had always been well until four months before admission

Present Illness Early in February 1931, the patient contracted a severe cold which was diagnosed as bronchitis About two weeks later, hemoptysis in the early morning developed and continued indefinitely On March 20, the patient complained of pain, and swelling, with redness, and local heat on the inner aspect of the right ankle At the end of ten days, the process localized, was incised, and drained This abscess, resisting all forms of treatment, continued to discharge a purulent material Six weeks later, two similar abscesses appeared about the face

Physical Examination

The patient was well nourished and well developed. He was critically ill and confined to bed.

Skin Examination

Over the face were six fairly large lesions,—one under each eye, one above the right eye, a smaller one on the chin, one over the left eyebrow, and one behind the right ear. The lesions were erythematous, verrucous, and very suggestive of blastomycetic dermatitis. Examination also disclosed an ulcerated lesion on the left large toe, a number of soft fluctuating abscesslike lesions on both legs, a broken down lesion on the right ankle, a smaller ulcerated lesion in the right patellar region, and a large, soft, fluctuating lesion on the dorsal aspect of the right forearm.

The author's impression of this condition was that it was either a generalized bromide eruption or else a systemic blastomycosis. He suggested that pus from the abscesses be examined for blastomycetes, using sodium hydropoxide to prepare the pus, that smears be taken from the lesions under the eyes and the small abscesses, and that the sputum be examined for blastomycetes. It was also suggested that the urine be examined for bromides. If blastomycetes were found, the patient was to be given large doses of potassium iodide by mouth, if bromide were found in the urine, it was suggested that he be given large doses of saline solution.

*Chest Examination**Inspection*

The chest was short, of medium thickness, and broad, the musculature was fair. There was very little depression over the infraclavicular spaces. Respiratory excursion was diminished in left upper portion.



FIG 1

Bones of the pelvis show evidence of discrete areas of destruction of bone tissue in the region of the neck of the right femur, right ilium, and sacro-iliac joints.

Palpation

No change in fremitus was noted except that possibly it was a little more pronounced in left upper portion

Percussion

Right—normal resonance

Left—area of impaired resonance above the third rib and above the eighth dorsal spine

Auscultation

Right—bronchovesicular breathing above third rib and sixth dorsal spine no riles, no increased whispered voice conduction

Left—bronchial breathing above second rib, bronchovesicular breathing below



FIG 2

Isolated areas of destruction were visualized in the sixth, seventh, and eighth ribs—interiorly on the left

second rib a few medium post-tussal riles heard at the very end of inspiration above the second rib

X-Ray

The x-ray revealed a homogeneous density above the third rib on the left side the edges were somewhat ragged There were no other abnormal shadows except that the

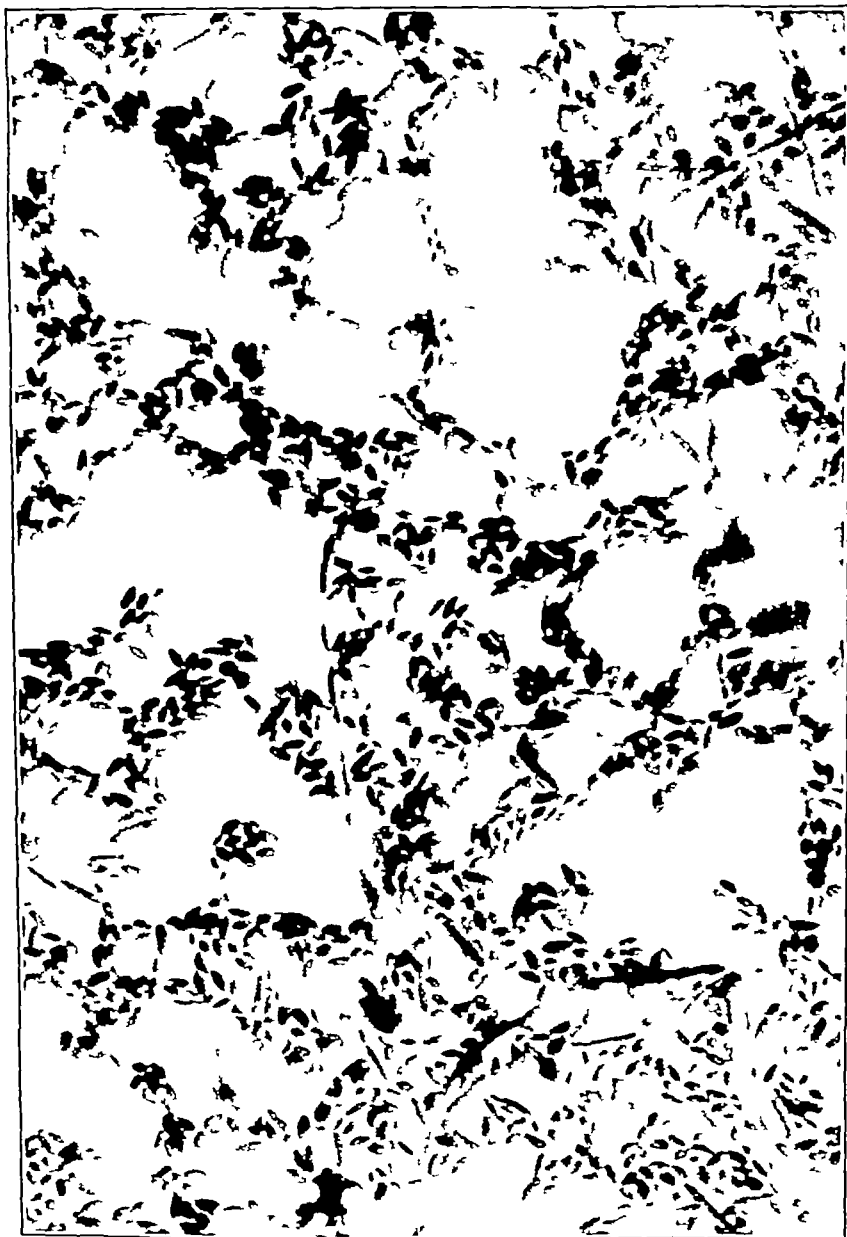


FIG 3

High-power photomicrograph showing blastomycetes Each body consists of an elliptical protoplasmic mass without a nucleus

diaphragm was rather high in the chest, since the patient's chest was short this fact may have had no significance

Discussion

The patient had no temperature and practically no sputum. The clinical picture did not present any pneumonic consolidation or lung abscess. The fact that he had been given a diagnosis of sarcoma of the foot warranted a diagnosis of metastasis.

Diagnosis

Metastasis, left lung

Treatment advised

Deep x-ray therapy

X-Ray Findings

Chest

A localized area of homogeneous density covered the left apex, indicative of an inflammatory process, neoplasm, or thickened pleura.

Right ankle

The anteroposterior and lateral roentgenograms showed an area of bone destruction on the border of the internal malleolus, due to necrosis. There was enlargement of the soft tissue over this region.

Pelvis

The bones of the pelvis showed evidence of a pathological process, characterized by destruction of bone tissue, in the region of the neck of the right femur, right ilium and both sacro-iliac joints.

Dorsal lumbar spine and skull

No anatomical or pathological variation from the normal was noted.

Laboratory Findings

Urinalyses

Six examinations, negative

Albumin, trace, white blood cells, moderate, cylindroids, few. Examination for bromide, negative.

Albumin, trace, mucus, increased, white blood cells, moderate, red blood cells, occasional, cylindroids, few.

Blood

Wassermann and Kahn tests, negative

Blood counts

January 13, 1932

Erythrocytes, 3,500,000, leukocytes, 12,900

Differential

Poly morphonuclears	80 per cent
Lymphocytes	15 per cent
Monocytes	5 per cent

February 10, 1932

Erythrocytes, 2,960,000, leukocytes, 10,900, hemoglobin, 60 per cent

Differential

Poly morphonuclears	79 per cent
Lymphocytes	16 per cent
Monocytes	4 per cent
Eosinophiles	1 per cent

A moderate amount of anisocytosis and a few poikilocytes were present.

March 1, 1932

Erythrocytes, 4,050,000, leukocytes, 12,600, hemoglobin, 80 per cent

Differential

Poly morphonuclears	80 per cent
Lymphocytes	15 per cent
Monocytes	5 per cent

April 4, 1932

Erythrocytes, 4,040,000, leukocytes, 28,600, hemoglobin, 75 per cent

Differential

Polymorphonuclear	88 per cent
Lymphocytes	10 per cent
Monocytes	2 per cent

A few poikilocytes were present

Scraping or smear from lesion under eye

Round and oval biconcave opaque bodies showing buds

Diagnosis Blastomycosis

Specimen from right ankle for biopsy

Gross description—two small sections of ulcer

Histological report—section of skin contained many small intradermal abscesses in which were seen opaque biconcave bodies morphologically consistent with blastomycosis. Many showed budding forms, also squamous-cell carcinoma

Diagnosis

(1) Blastomycetic dermatitis

(2) Squamous cell carcinoma

Clinical Diagnosis The original diagnosis of multiple ulcers was changed to

(1) Systemic blastomycosis

(2) Squamous-cell carcinoma of right ankle, with metastasis to left lung

Treatment Irradiation of right ankle

Deep x-ray therapy

200 kilovolts, 30 milliamperes, focal skin distance 50 centimeters

Filters 0.5 copper, 2.0 aluminum, plus 45 oil

Seventy per cent x-ray dose applied to lesion in one sitting

Time, nine minutes

Radium bomb

One and one-fourth erythema dose

Course The patient died on May 8, 1932

DISCUSSION

In the case reported, the patient was admitted with a diagnosis of osteosarcoma of the right tibia, this diagnosis was carried until the smear revealed the presence of blastomycetes. The portal of entry was unknown. The possibility of blastomycosis should be considered in all chronic osteomyelitic lesions and the pus examined for blastomycetes. This is especially true when we realize that tuberculosis, coccidioidal granuloma, and blastomycosis produce the same pathology.

CONCLUSIONS

1 Blastomycosis of bone is usually a manifestation of systemic involvement

2 Diagnosis is made by identification of blastomycetes

3 Tuberculosis, coccidioidal granuloma, and blastomycosis produce the same pathology

4 The pus from all chronic osteomyelitic lesions should be studied for blastomycetes

as shivery as a wild colt. The side rods were brazed to the ring, instead of being welded to it, and could not be bent at the ring to make the ring fit without breaking off, and the ring was not shaped and tilted at its junction with the side rods to make it possible to fit it against the tuberosity of the ischium, but always it must rest against the sensitive and yielding perineum.

A certain number of joints that have suffered disease or injury are left stiff. We say there is ankylosis, bony or fibrous. Thomas said that ankylosis, whether bony or fibrous, is "sound" or "unsound",—sound, when deformity does not develop from use, and unsound when deformity does develop from use. So long as the joint is unsound, deformity may be corrected. To correct deformity in a sound ankylosis, it must first be made unsound.

Thomas washed out infected joints by means of a "three-way" syringe, the suction force being a rubber hand bulb. The metal part had an opening to the left for a large needle, one to the right for the suction tube to the solution, and below an opening to eject the fluid withdrawn from the joint, or abscess cavity, into a basin.

Bow legs and knock knees he treated with simple side irons. In so far as I know, he was the first to recognize that effective lateral pressure to correct knock-knee can be had only when the knee is held fully straight,—that the least flexion at the joint releases a lateral strain. He devised an efficient and rapid osteoclast, which he used in the older cases.

Pronated feet were righted by tilted shoe heels, extended forward under the scaphoids, and anterior arches were relieved of pain by cleats across the soles of the shoes.

Thomas used his hip splint for the treatment of fractures of the neck of the femur. Supported on this splint, one fragment was not rotated on the other every time the bed pan was put under the patient, and the patient could be turned on the face twice a day without discomfort or disturbing the fracture. First, the leg was pulled down as far as possible, rotated inward, and held there. Then the splint was slipped under the patient and fitted, adhesive strips were put on the thigh and leg and fastened to the wings of the ankle band, and an additional angular bar was screwed to the bottom of the main stem to control the rotation of the limb and hold the foot at right angles to the leg, and the shoulder straps were left off, so that the splint would work downward. Thomas missed the important abduction which after his death Whitman brought forward, but he gained strong and useful union in all his cases, whether bony or fibrous he did not know, or care. This statement will be doubted. How could he do it? By continuing treatment until he did get stable union, even up to eighteen months or more of uninterrupted immobilization. He believed as a general principle that elevating a broken bone delayed its union. A patient with a fracture of the patella was fitted with a caliper splint, with the knee fully extended and held so by a sheet-iron gutter splint on the front of the thigh and shin, which crowded the fragments toward each other and induced local congestion. The patient returned to his work on the following day, and continued to work during the period of treatment. Thomas thought it did not matter whether the union was bony or fibrous as long as it was strong and permanent. A Pott's fracture was protected by an outer side iron with a T-strap and the heel of the shoe tilted up on the inner side. I saw him put up a compound fracture of the tibia. The bone was "set" and held, all devitalized tissue was trimmed away (twenty years before we were told about *debridement*), the wound irrigated with a salt solution, the surrounding skin smeared with a bland oil and the wound left open. The leg was surrounded by a two-inch pad of screened sawdust, held between open-meshed towels, and made damp by a solution of corrosive sublimate, carbolic acid, and chloride of lime.

Recent Colles' fractures, and malunioned Colles' fractures after he had refractured them (I saw him do five one Sunday), were "set" and pronated, and held in skewed sheet-iron gutter splints padded with felt. The patient's arm was supported by a bandage clove-bitched around the wrist and carried around the neck, the hand hanging prone. A refracture was treated without an anæsthetic while the patient sat in the waiting-room, apparently to impress the other patients and to cause gossip. Thomas employed

the same procedure when reducing old (six weeks or more) dislocations of the shoulder. The arm was threaded through a fixed, thickly-padded steel ring up to the shoulder, two men grasped the wrist and pulled at full strength as, and in the direction in which, Thomas directed, while he pushed down on the shoulder. It should be noted that there was no leverage on the arm. The socket was pushed *onto* the head, not the head *into* the socket.

Thomas was the first to use local hyperaemia, sometimes carried to local oedema, in the successful treatment of delayed union of fracture of the humerus by the use of rubber tubing tied around the limb—and this was before Bier had yet received his medical degree. To the local hyperaemia, he added hammering, the skin being protected by felt, calling it “hammering and damming.” I saw him treat a fractured tibia in which union was delayed. Instead of rubber tubing, he used inelastic strips of adhesive plaster and carefully pointed out that if the lower band was somewhat less tight than the upper one the local swelling would be *only* between the encircling bands. In outward slipping of the patella, he raised the outer condyle by hammering.

Thomas read widely, and always sought the truth. He was argumentative and intolerant of all who refused to admit proved facts, he said his say without restraint and with barbed words. He was a loyal and a generous friend. He craved friendship and love and found practically none outside of his own family.

The art of Medicine is to observe, to correlate those observations, and to reason logically to conclusions that must finally become the true principles of practice. Those were the qualities that made Thomas great. His greatness lay in the *principles* upon which his practice was founded. It was upon right principles that he insisted, not upon this or that mechanical appliance.



MURK JANSEN

SEPTEMBER 22, 1867—MARCH 1, 1935

In 1922, Dr. Murk Jansen of Leiden accepted President Allison's invitation to attend the Annual Meeting of the American Orthopaedic Association in Washington, D. C. Something of his work in Holland was known, but only a few members were conversant with the original theories he had advanced as to the etiology of many developmental skeletal anomalies. The man himself was a stranger to us, but when he left he had become a friend, and the Association felt richer for the visit of this tall and gentle crusader. Even if American wits were not keen enough to follow all the ramifications of thought by which he reached his conclusions, all who listened to him recognized an erudition, an openness of mind, and a singleness of purpose which compelled admiration.

Wandering over the sand dunes near the sea, he was reminded of his own country and made us aware of the effort he was making to have his specialty duly recognized, of

the clean battles he was fighting, of the new clinic he was organizing. There was a suggestion of a weariness of spirit, but his head remained unbowed.

After many years of struggle, the battles were won. With a large part of his personal fortune thrown into it, the clinic grew and a large new hospital was built. Weariness passed, increasing strength came. The prophet had fame in his own country and glory in all others.

He was one of the founders of the *Société Internationale de Chirurgie Orthopédique* and after the death of his intimate friend Sir Robert Jones, Jansen was elected to succeed him as President. The *Société* owes him much, for its members speak many tongues and he was familiar with them all. With Prof. Vittorio Putti as his coadjutor, he became the great interpreter not only of the papers read, but of the thoughts of the leaders. Cohesion would have been almost impossible without these two dispassionate polyglots.

In 1934, this chief orthopaedic surgeon of Holland visited us again, this time as an international figure. The genuineness of the welcome which he and his charming wife received may well have cheered them. The American Orthopaedic Association was honored by their presence.

Jansen's name will always be associated with his profound study of the background causes of abnormal skeletal development. The most common etiological factor in these aberrations he believed to be exhaustion of the mother which resulted in "feebleness of growth" evident in the offspring of rapidly succeeding pregnancies. The paths by which he reached his conclusions were cut through virgin forest often encumbered by windfalls of previously held theories and accepted "laws." He adventured into by-paths and there were many important by-products of these explorations. When he began, he had no accurate compass and these paths are winding and sometimes difficult to follow. Unless we do follow carefully the blazes of the main trail, we have little right to complain if we do not reach his point of view. The recent work of Harris* and others suggests strongly that, from the eminence which Jansen attained, new truth has been discovered. This truth seems likely to make us free of many untenable dogmas.

An idea of the productiveness of his thought and of the industry of his pen may be gained from his six or more books and from over sixty monographs written in many languages beside his own.**

The courage and sweetness of this great man's character continued to the end. The closing sentences of a letter written to a friend only two weeks before his death are evidences of his fortitude and faith: "Is not this a fateful course? I wonder whether you ever witnessed it. I am now preparing for my last journey on this globe, which I hope may be near by. May God be with you for many years to come."

Three years ago, Mr. Walter Lippmann† wrote an appreciation of Mr. Justice Oliver Wendell Holmes upon his retirement from the Supreme Court of the United States. With equal poignancy it is a tribute to Murk Jansen: "Here is the heroic life complete, in which nothing has been shirked and nothing denied—not battle, or death, or the unfathomable mystery of the universe, or the loneliness of thought, or the humors and the beauties of the human heritage. This is the whole of it. He has had what existence has to offer: all that is real, everything of experience, of friendship and of love, and the highest company of the mind, and honor, and the profoundest influence—everything is his that remains when illusion falls away and leaves neither fear nor disappointment in its wake."

* Harris, H. A. *Bone Growth in Health and Disease*. London, Humphrey Milford, 1933.

** *The Journal of Bone and Joint Surgery* will furnish the bibliography of Dr. Jansen upon request.

† *New York Herald Tribune*, January 13, 1932.

News Notes

It is with very great regret that we learn of the death of Dr. Franklin H. Martin, Director-General of the American College of Surgeons, at Phoenix, Arizona, on Thursday, March 7. It is fortunate that the College has been able to benefit from the active service of Dr. Martin from the early conception of this association to the present day, when it is now so firmly established and recognized throughout the world.

The Editorial Board of *The Journal* takes pleasure in announcing that, beginning with this issue, *The Journal* will also be considered the official publication of the American Academy of Orthopaedic Surgeons. Some of the papers read at the Annual Meetings of the Academy, as well as the reports of the Meetings, will be published in *The Journal*.

The Editor is glad to announce that, in accordance with the vote of the Executive Committee of the American Orthopaedic Association, the following members have been appointed as Associate Editors of *The Journal*: Z. B. Adams, M.D., Murray S. Danforth, M.D., Leo Mayer, M.D.

The Annual Meeting of the **Michigan Orthopaedic Society** was held on January 24 at the Detroit Athletic Club. Matters pertinent to minor changes in the Public Act for the care of indigent cripples in the state were discussed. The officers elected for the ensuing year are:

President F. H. Purcell, M.D.
Vice-President A. G. Goetz, M.D.
Secretary F. J. Fischer, M.D.

The Bronx Orthopaedic Club was recently organized and the following officers were elected:

President Samuel W. Boorstein, M.D.
Vice-President James W. McAtcer, M.D.
Secretary-Treasurer Louis Saltzman, M.D.

Meetings are to be held at the Bronx Hospital, New York City, on the first Wednesday of each month.

Notice has been received from Prof. H.-L. Roher, Vice-President of the **Société Française d'Orthopédie**, of a meeting of this society which will be held in Bordeaux on Friday and Saturday, June 7 and 8, 1935. During these two days, papers will be presented and visits made to the hospitals. Advantage will be taken of the time of the year for excursions to the neighboring places of interest on Sunday and Monday following the meeting.

The Annual Meeting of the **American Association on Mental Deficiency** will be held at the Hotel Palmer, Chicago, on April 25, 26, and 27. Physicians are cordially invited to attend these sessions. Complete data on the program may be obtained from the Secretary, Dr. Groves B. Smith, Godfrey, Illinois.

In an article by Dr Ralph M. Carter in *The Journal* for October 1934 and also in an article by Dr Eugene J. Bozsán in *The Journal* for October 1932, the principle of bone drilling as a method of promoting bone union is discussed. The same principle is discussed in three other articles by Dr Bozsán published in *The Journal* in 1934. In the paper by Dr Carter, a reference to the method of Beck is given as the earliest mention in the literature. Since the publication of these articles, it has been found that this method was described eighty years ago by Dr Daniel Brainard of Chicago in a paper presented at the meeting of the American Medical Association in 1854 and published in the Transactions of the Association, Volume VII, page 557, 1854.

The two authors generously wish to make acknowledgment of this earlier presentation and to give to Dr Brainard credit for the work. In making this acknowledgment, Dr Carter writes

'Dr Daniel Brainard was Professor of Surgery in Rush Medical College, and his paper, which was a Prize Essay, was published in full in the Transactions of the Association (Volume VII, page 557, 1854), entitled Essay on a New Method of Treating Ununited Fractures and Certain Deformities of the Osseous System'

There is described a perforator which he devised, which was to be used to make multiple perforations through the ends of the fragments across the line of fracture, in doing this, the perforator was to be withdrawn from the bone, but not from the skin. Further paralleling my recent description, he also devised an instrument to prevent the point of the perforator from slipping. Seven successfully treated cases are described.

'I think there can be no question but that the credit for originating this method belongs to Dr Brainard, and I gladly make this acknowledgment.'

Dr Bozsán writes

'The work is a prize essay indeed and, in my humble opinion, it compares with that other American classic, the work of William Beaumont on the physiology of digestion.

'Aside from a certain stateliness of the language, the work is remarkably up to date,—in fact, some of its concepts mark it ahead of our day.

"I wish to make respectful acknowledgment of the fact that the concept and practical accomplishment of vascularization of bone for the purpose of osteogenesis, which has occurred to a few workers, among them myself, only recently, are fully contained in this work, now more than eighty years old."

The Ninth Congress of the Deutsche Gesellschaft für Unfallheilkunde, Versicherungs- und Versorgungsmedizin was held at Würzburg on October 12 and 13, 1934, with Geheimrat König as Chairman.

Of the two main themes, brain injuries and the sensitive knee, only the latter is of orthopaedic interest.

Burckle de la Camp, of Bochum, discussed the group of cases in which the patients had indefinite complaints and somewhat ambiguous traumatic histories,—namely, the recurrent effusions and injuries of the cartilages and menisci, changes of the synovial membrane and of Hoffa's fat bodies, and strains of the ligaments of the joints. He stressed the varieties of knee injuries occurring in different localities and with different occupations. In osteochondritis dissecans he believes that a traumatic etiology is possible. Chondromalacia of the patella is due to a constitutional predisposition, although trauma may be an incidental feature. Although an inflammation of the fat pad, as described by Hoffa, is seldom seen as an isolated phenomenon, it is found to accompany almost all the internal derangements of the knee joint as a lipo-arthritis.

Andresen, of Bochum, described the peculiarities of the knee joints found in minors. The main characteristic is a degeneration of the meniscus, leading to an injury after extremely slight trauma.

Gebhardt, of Hohenlychen, spoke chiefly of the gradual degeneration of the tissues of the knee. This does not prevent use of the knee joint for sedentary occupations, and even for a few rapid motions, but makes it impossible to use the knee for a long period of continuous exertion. The muscle bundles frequently show an injury at the point of attachment to their tendons. If this muscle injury has occurred as the result of a simple trauma, it is easy to cure. If, however, it is the result of a slow degenerative process, the prognosis is bad.

According to Port, of Würzburg, scoliosis practically never results from trauma. Baumecker, of Hanau, studied the late results of reduced dislocations of the cervical vertebrae and found that there were no permanent disabilities. Even in cases of incomplete reduction, the permanent injury was extremely slight. On the other hand, Simons of Jena, pointed out that degeneration of the vertebral discs almost always causes severe clinical symptoms.

Particularly instructive was the demonstration by König, of Würzburg, of a large number of patients on whom he had performed open operations for fracture, using Lane plates, metal screws, etc. In many of these patients the foreign bodies had remained *in situ* for many years without causing any symptoms. Ostermann, of Essen, believes that healing after fractures occurs more rapidly in cases treated by plaster-of-Paris than in those treated by traction or open reduction.

Of numerous other contributions, mention is made only of the paper by zur Verth, of Hamburg, who discussed the relative advantages of the Pirogoff and Syme amputations. He advises the Pirogoff amputation chiefly because it permits a shortening of the stump and thereby makes it easier for the technician to fit an artificial limb. The loss in weight-bearing function, noted in a number of cases in which the Pirogoff amputation was performed many years after the operation, is due to the marked bone atrophy which gradually ensues.

The Third Annual Meeting of the American Academy of Orthopaedic Surgeons was held January 14, 15, and 16 at the Waldorf-Astoria Hotel in New York City, under the presidency of Dr. Philip D. Wilson. The following program was presented:

MONDAY, JANUARY 14

Morning Session

Congenital Defects of the Lumbosacral Joint with Associated Nerve Symptoms

Dr. Lewis Clark Wagner, New York, N. Y.

Correction of Congenital Scoliosis

Dr. Leo Mayer, New York, N. Y.

Posterior Spondylolisthesis of First and Second Lumbar Vertebrae. Report of a Case

Dr. Edwin W. Ryerson, Chicago, Illinois

Treatment of Paralytic Scoliosis

Dr. Michael Hoke, Warm Springs, Georgia

Costovertebral Strain

Dr. Lloyd T. Brown, Boston, Massachusetts

Follow-Up of Back Cases Done Since 1924

Dr. Charles E. Avers, Worcester, Massachusetts

Executive Session

Report of American Board of Orthopaedic Surgery, Inc.

Dr. Melvin S. Henderson, Rochester, Minnesota

Afternoon Session

Brodie's Abscess of Ilium Following Sacro-Iliac Arthrodesis

Dr. Jennings M. King, Pittsburgh, Pennsylvania

Gas Gangrene in Civil Practice

Dr. Ralph Ghormley, Rochester, Minnesota

Hemangioma of the Sciatic Nerve

Dr Frank H Purcell, Detroit, Michigan

Soft-Tissue Tumors of the Extremities

Dr Edgar M Bick, New York, N Y

Symposium on Bone Tumors

The Place of Biopsy in Bone Tumors

Dr James Ewing New York, N Y

Indications for the Toxins of Erysipelas and Bacillus Prodigiosus in the Treatment of Bone Sarcoma, with Special Reference to Endothelial Myeloma

Dr William B Coley, New York, N Y

Treatment of Osteogenic Sarcoma

Dr Willis C Campbell, Memphis, Tennessee

Treatment of Giant-Cell Tumors of the Long Bones A By Surgery, B By Irradiation

Dr Charles F Geschickter, Baltimore, Maryland

TUESDAY, JANUARY 15

Morning Session

Knee-Flexion Contracture Treated by Skeletal Traction

Dr G E Haggart, Boston, Massachusetts

Two Simplified Knee Operations Fusion, Block for Recurvatum

Dr Joseph E Milgram, New York, N Y

Slipping Patellae

Dr Frank Ober, Boston, Massachusetts

Studies on Effect of X-Rays on Growth, Regeneration, and Phosphatase Activity in Bone

Dr Eugene Regen, Nashville, Tennessee

The Recovery of Function in the Hand in Chronic Arthritis

Dr John G Kuhns, Boston, Massachusetts

Symposium on the Shoulder

Anatomical Observations on Senile Changes in the Shoulder

Dr E Lawrence Keyes, St Louis, Missouri

So Called Periarthritis or Bursitis of the Shoulder with Etiology and Treatment

Dr Arthur Steindler, Iowa City, Iowa

End Results of the Nicola Operation for Recurrent Dislocation at the Shoulder

Dr Toufick Nicola, New York, N Y

General Discussion

Dr E A Codman, Boston, Massachusetts

Afternoon Session

Short Summary on Blood Sugar after Fractures

Dr Robert V Funsten, University, Virginia

Fractures of the Femoral Shaft Treated by an Ambulatory Method

Dr Roger Anderson, Seattle, Washington

The Use of Kirschner Wires for Fixation of Fragments in Joint Fractures

Dr John C Dieterle, Milwaukee, Wisconsin

Bone Graft in the Treatment of Non-Union

Dr J Sims Norman, Pueblo, Colorado

Gull Plate Graft in the Treatment of Ununited Fractures of the Long Bones

Dr Paul N Jepson, Philadelphia, Pennsylvania

The Early Stages of Ankylosing Spondylitis (Marie-Strümpell Disease)

Dr Jacques Forestier, Paris, France (By invitation)

President's Address

Dr Philip Wilson, New York, N Y

Evening

Banquet

WEDNESDAY, JANUARY 16

Morning Session

The Acetabular Index in Infants in Relation to Congenital Dislocation of the Hip

Dr Samuel Kleinberg, New York, N Y

Dr Herman S Lieberman, New York, N Y

Slipping of the Upper Femoral Epiphysis Treated by Traumatization

Dr Samuel A Jahss, New York, N Y

Destructive Spine Lesions Diagnosis by Needle Biopsy

Dr Robert Crawford Robertson, Chattanooga, Tennessee

The Relationship of the Prostate Gland to Orthopaedic Problems

Dr Wallace S Duncan, Cleveland, Ohio

Symposium on Fractures of the Hip

Treatment of Fractures of the Neck of the Femur by Internal Fixation with Kirschner Wires

Dr Nicholas Ransohoff, New York, N Y

Use of Kirschner Wire in Fractures of the Neck of the Femur

Dr David Bosworth, New York, N Y

Fractures of the Femoral Neck Treated by Blind Nailing

Dr John W O'Meara, Worcester, Massachusetts

Subcutaneous Pin Fixation of Fresh Fractures of the Neck of the Femur

Dr Frederick J Gaenslen, Milwaukee, Wisconsin

End Results of Intracapsular Fractures of the Neck of the Femur Treated by the Wilke Method

Dr John D Adams, Boston, Massachusetts

Afternoon Session

The Congenitally Deep Acetabulum Intra-Pelvic Protrusion

Dr A M Rechtman, Philadelphia, Pennsylvania

Iliopectineal Bursitis

Dr Denis S O'Connor, New Haven, Connecticut

Shelf Stabilization of the Hip A Study of Sixty Cases

Dr M Beckett Howorth, New York, N Y

Disturbance of Function of the Mediotarsal Joint

Dr John Joseph Nutt, New York, N Y

The Correction of Rachitic Deformities by Preliminary Decalcification

Dr Harry Finkelstein, New York, N Y

Decalcification to Permit Manual Correction of Deformities

Dr I W Nachlas, Baltimore, Maryland

Executive Session

On January 17, a Clinical Day was held and the members and guests visited the various hospitals to witness operations and other orthopaedic proceedings

At the Executive Session on January 16, the following officers were elected for 1936

President Frank D Dickson, M D, Kansas City, Missouri

President-Elect Melvin S Henderson, M D, Rochester, Minnesota

Vice-President Lionel D Prince, M D, San Francisco, California

Treasurer E Bishop Mumford, M D, Indianapolis, Indiana

Secretary Philip Lewin, M D, Chicago, Illinois

Dr Clay Ray Murray was chosen as Chairman of the Program Committee and Dr W B Carrell was added to the Committee

The following were added to the Committee on Fractures and Traumatic Surgery: Roger Anderson, M D, LeRoy Abbott, M D, Wallace Cole, M D, Guy Caldwell, M D, H H Hitchcock, M D, Frederick Kidner, M D, Robert Schrock, M D, Lawson Thornton, M D, and John Wilson, M D

The Scientific Exhibits were considered one of the most important features of the Meeting and prizes were awarded for the finest. A gold medal was awarded to Dr

Sheldon A. Jacobson, and a silver medal to Dr. William B. Coley. The following were given awards of merit for their scientific exhibits: Isidore Zadek, M.D., David Sashin, M.D., Charles J. Sutro, M.D., A. R. Shands, Jr., M.D., Loring T. Swann, M.D., and Aaron Bodansky, M.D.

The Commercial Exhibits were carefully chosen and proved very helpful and instructive.

It was decided to have the Fourth Annual Meeting in St. Louis, Missouri, on January 13, 14, and 15, 1936. Dr. J. Archer O'Reilly of St. Louis was appointed Chairman of the Committee on Arrangements.

The Forty-Ninth Annual Meeting of the American Orthopaedic Association will be held in Philadelphia, Pennsylvania, June 5 to 8, under the presidency of Dr. DeForest P. Willard. The preliminary program is as follows:

THURSDAY, JUNE 6

Morning Session

President's Address

Dr. DeForest P. Willard, Philadelphia, Pennsylvania

Symposium on Arthritis

Experimental and Pathological Studies in the Degenerative Type of Arthritis

Dr. Walter Bauer, Boston, Massachusetts (By invitation)

An Analysis of the Treatment of 200 Cases of Arthritis

Dr. Ralph Pemberton, Philadelphia, Pennsylvania (By invitation)

Atrophic Arthritis: Discussion of Therapy with Particular Reference to the Use of Autogenous Vaccines

Dr. Joseph A. Freiberg, Cincinnati, Ohio

The Prevention of Deformity in Chronic Arthritis

Dr. Loring T. Swann, Boston, Massachusetts

Arthritis as a Teaching Problem

Dr. Robert W. Johnson, Jr., Baltimore, Maryland

The Social and Economic Aspects of Chronic Arthritis

Dr. Robert B. Osgood, Boston, Massachusetts

Executive Session

12:00 Noon

Afternoon Session

X-Ray Diagnosis of the Sacro-Iliac Joint

Dr. W. E. Chamberlain, Philadelphia, Pennsylvania (By invitation)

The Role of the Iliotibial Band as a Factor in the Causation of Low Back Disabilities and Sciatica

Dr. Frank R. Ober, Boston, Massachusetts

The Adolescent Sacro-Iliac Joint Syndrome

Dr. Mark H. Rogers, Boston, Massachusetts

Dr. H. B. Cleaves, Boston, Massachusetts (By invitation)

The Treatment of Choreo-Athetosis by Chordotomy: A Report on the Treatment of Six Cases

Dr. Fremont A. Chandler, Chicago, Illinois

FRIDAY, JUNE 7

Morning Session

Fracture Symposium

A Study of 1000 Consecutive Fracture Patients Treated at Various Hospitals in Lincoln, Nebraska During Five Years (1929-1934) with an Analysis of Treatment Methods and Results

Dr. H. Winnett Orr, Lincoln, Nebraska

Fractures into and about the Knee Joint

Dr Robert D Schrock, Omaha, Nebraska

Surgical Reconstruction of Malunited Fractures about the Ankle

Dr J S Speed, Memphis, Tennessee

Fractures of the Shoulder

Dr Robert V Funsten, University, Virginia

A Study of Fractures of the Forearm Reduced by Direct Leverage during the Past Fifteen Years

Dr J E M Thomson, Lincoln, Nebraska

The Treatment of Carpal Fractures

Dr Kellogg Speed, Chicago, Illinois

Afternoon Session

Internal Fixation in Fractures of Long Bones

Dr W B Carrell, Dallas, Texas

Old Dislocations of the Shoulder

Dr George E Bennett, Baltimore, Maryland

End Results of the Tenosuspension Operation for Recurrent Dislocations of the Shoulder

Dr M S Henderson, Rochester, Minnesota

Summary of Joint Involvement in Ninety-Eight Cases of Hemophilia

Dr H B Thomas, Chicago, Illinois

SATURDAY, JUNE 8

Morning Session

The Treatment of the Calcaneus Foot

Dr Oscar L Miller, Charlotte, North Carolina

Late Results in Osteomyelitis in Children

Dr John C Wilson, Los Angeles, California

The Effect of Sympathectomy upon the Growth of Legs Paralyzed by Anterior Poliomyelitis

Dr Robert I Harris, Toronto, Canada

Fixed Paralytic Pelvic Obliquity

Dr Leo Mayer, New York, N Y

The Treatment of Club Feet

Dr Lloyd T Brown, Boston, Massachusetts

Hemiatrophy and Hemihypertrophy, with a Report of a Case of Hemihypertrophy of One Extremity

Dr Charles W Peabody, Detroit, Michigan

Executive Session

12 00 Noon

Current Literature

HUGH OWEN THOMAS A PERSONAL STUDY By Frederick Watson London, Humphrey Milford, 1934 12 shillings, 6 pence

Mr Watson, the son-in-law and literary executor of Sir Robert Jones and author of 'The Life of Sir Robert Jones', thought it fitting to publish a memorial volume on the hundredth anniversary of the birth of Hugh Owen Thomas. Some thirteen years ago, Sir Robert Jones delivered a lecture at the Liverpool Medical Institute entitled 'Hugh Owen Thomas The Man and His Work', which he intended to expand into a book. From this unpublished lecture, Mr Watson has quoted generously. He also asked an American orthopaedic surgeon who had visited Thomas in 1887 and 1890 to write of his personal reminiscences, and much of this material has been made use of in this book. He also had for his study that sympathetic chapter on Thomas in Sir Arthur Keith's "Menders of the Maimed", and certain letters written by and to Thomas' ancestors, as well as other papers of like nature. From these sources, Mr Watson has accomplished his task in a very charming manner, but it obviously was a task, and not a labor of love as was his "Life of Sir Robert Jones".

It is difficult for the reviewer to refrain from mentioning the principles which Thomas enunciated and the wonders of his practice, for from him came more permanently good things than from any other man in all medical history. He is now widely known among surgeons because of just one splint that he devised, although the material, form, and use of that splint is not understood by most of those who use it. He would have wished to be remembered, not as the inventor of a splint, but rather for the principles of treatment which he taught, and in which he was a pioneer. These principles are clearly set forth in Mr Watson's book.

DAS MENSCHLICHE BEIN SEINE NORMALE ENTWICKLUNG UND DIE ENTSTEHUNG DER WUCHSFEHLER (HÜFTLUXATION, X- UND O-BEINE, KNICK- UND PLATTFÜSSE, KLUMPFUSS) [The Human Leg Its Normal Development and Abnormalities of Growth (Dislocation of the Hip, Knock-Knee, Bow-Leg, Pronated Feet, Flat-Foot, and Club-Foot)] By Dr MAX BÖHM Stuttgart, Ferdinand Enke, 1935 20 marks

Dr Max Böhm has been recognized for several years as an authority on congenital deformities of the lower extremity, particularly with regard to etiology. In his studies of the various deformities, he has always traced the physiological or normal development of the part. Now he has fulfilled his desire of long standing by correlating and assembling the individual studies in a single book. The monograph is divided logically into two parts. The first two-thirds deals with the normal development of the lower extremity, and the last third with the abnormalities of growth which lead to deformity of the hip, knee, ankle, and foot.

By tracing the embryology of the human foot, he shows the similarity of form at one stage to that of the club foot. By following the curves of the lower extremity through prenatal life, infancy, and childhood, he establishes the physiological norm in the transition from bow-leg to knock-knee, flexed to back-knee, and internal to external rotation of the foot. With the last are correlated the rotational changes of the knee and hip. The alterations in shape and direction of the femoral head and the acetabulum are significant. The immature forms persist in congenital dislocation of the hip. The transition from minus torsion of the femoral neck in the young embryo, to zero torsion in the embryo of three months, to about 30 degrees in the new-born, and to 12 degrees in the adult is well presented. The correlated changes in the skeletal framework as a whole are shown diagrammatically.

A chapter on comparative anatomy shows the similarity of the embryonic and infantile structures to those of the gorilla.

Working with the Anatomy Department of the University of Berlin, Böhm has prepared bones and wax models which, with the numerous tracings and other cuts, illustrate each anatomical problem. He has compared his findings with those available in the literature and arranged the material in easily assimilable form. The details of his observations may be overwhelming to one who is only casually interested, but the cuts are plentiful and supplied with self-explanatory legends so that the most important facts could be learned without even reading the text.

Of considerable practical importance because of its bearing on the treatment of congenital deformities, the work is of tremendous cultural significance in furnishing a background for the appreciation of the physiological development of the lower extremity. It should be carefully studied by any one who is truly interested in surgery of the lower extremity or the diseases of children.

ELEMENTARY HUMAN ANATOMY BASED ON LABORATORY STUDIES By Katharine Sibley. New York, A. S. Barnes and Company, 1935. \$4.50.

This new text-book of anatomy is based on the author's experience in teaching anatomy to college under-graduates. It is intended as a foundation particularly for the study of kinesiology and physiotherapy. Especial emphasis is, therefore, rightly placed on the skeletal, muscular, and nervous systems, the consideration of which comprises three-fourths of the volume. The circulatory, alimentary, respiratory, urogenital, and endocrine systems and the organs of special sensation are adequately, but much more briefly, treated in the remaining chapters.

In the early chapters the bones, joints, and muscles are described and discussed in detail, particularly with a view to an understanding of their physiology, in order to aid thereby the teachers of corrective physical education in muscle examination and muscle reeducation. This portion of the body is rightly regarded as a motor mechanism, the proper understanding of whose disabilities should be based upon an accurate appreciation of function.

Every chapter is based upon laboratory studies which are to be performed by the student so far as possible on living subjects, otherwise by the means of manikins, models, and charts.

The illustrations, 213 in number and several of them in colors, are chiefly selected from other standard text-books of anatomy and form an admirable atlas of the essentials of anatomical structure and development.

To the best of the reviewer's knowledge, there has been hitherto no text-book designed with exactly this emphasis and purpose and, as Dr. Wilfred Grenfell points out in his foreword to the volume, this work should be of definite value, not only to under-graduate students and their teachers, but to students, teachers, and practitioners of physiotherapy and occupational therapy.

STANDARD CLASSIFIED NOMENCLATURE OF DISEASE Edited by H. B. Logie. Ed. 2. New York, The Commonwealth Fund Division of Publications, 1935. \$3.50.

The need of a systematic nomenclature has been felt for a long time in every large hospital and also by surgeons in general. All branches of medicine and surgery and various specialties have, through their committees, been at work since 1930 in building up a standard systematic nomenclature. The first edition of the results of this task appeared in 1933 and received the general support of hospitals, etc. So complicated an affair as a classified nomenclature must necessarily show the need, through its use, of some modification to make it practical for universal adoption. The collaborators have now had the benefit of the past few years of experience of the hospitals and the men who have used the book, and have profited by this experience in issuing the second edition of this important work.

The diseases are classified by region, each region having a number. Following the topographical classification comes the etiological classification, and each region and each etiological factor is designated by a numeral placed at the left and right of a dash.

It is very important that the present system be adopted by all hospitals and institutions of medical learning throughout America, and this present volume will greatly aid in the accomplishment of this task.

THE CRIPPLED AND THE DISABLED By Henry H. Kessler New York, Columbia University Press, 1935 \$4.00

No physician should venture an opinion upon the question of disability in a given case, where an industrial accident has inflicted injury upon a worker, without having digested the information contained in this book. It brings together, in sufficient detail, summations of the masses of accumulating evidence that must form the basis for solution of one of our most acute social problems. It forcefully emphasizes the fact that the number of absolutely normal individuals is unthinkably small, that from remotest history the existence of physical handicaps has been looked upon as deserving of some degree of ostracism, based at first upon superstition as to their cause and later upon the economic grounds for the discard of those so afflicted. Modern society, confronted with the problem of dealing with the situation as it has developed in industry as well as among the congenitally handicapped and otherwise chronically afflicted, has sought to solve it by private means and, particularly of late, by proposed public measures of social insurance at Governmental expense, involving a staggering financial outlay and, of far more serious consequence to society, a demoralization of individual morale.

Factual information supplied in this volume indicates that a very large proportion of those thus afflicted need not necessarily be regarded as permanently or very seriously thrown out of the running if the facts available are assessed at their true value. One of the largest employers of labor in this country asserts that society can absorb all of its handicapped and pay them a full wage and not do it as charity. In his own plant, he could use 1,400 men with one leg, a similar number with one arm, and so on. He once put a blind man at work sorting nuts and this man was able to sort as many as two normal men had done before. The problem is one of vocational maladjustment except in the case of the comparatively small group who are so seriously handicapped that they will always remain totally unproductive. This group must be certified for pensioned support. The machinery is at hand for meeting the situation in Federal and associated State commissions. What is needed is the overcoming of social prejudice and a campaign of educational propaganda, which, in the author's opinion, would solve the difficulties without resort to any revolutionary changes in our methods.

Under six headings the different classes are briefly discussed and a short summary at the end of each chapter epitomizes the subject. Following this is a short chapter which succinctly clarifies the entire subject.

Appendix I contains a brief statement of the compensation provisions in the several states in respect to second injuries, and Appendix II includes a summary of vocational rehabilitation legislation, also by states. In Appendix III are all the state laws dealing with the blind, and finally is appended an extensive bibliography.

The note of authority which pervades the whole book is derived from the fact that the author is the Medical Director of the New Jersey State Rehabilitation Commission.

A TEXTBOOK OF SURGERY By W. Wayne Babcock Ed. 2 Philadelphia, W. B. Saunders Company, 1935 \$10.00

This book has all the merits of the first edition with many additions. The paper, print, arrangement, illustrations, and general appearance are excellent. The book is divided into four parts,—General Surgery, The Surgery of Systems, Surgical Technique, and Regional Surgery. In this edition many new subjects appear, and many forms of treatment that have been discarded for newer methods have been omitted.

The chapters on "Fractures", "Joints", "Dislocations", "Muscles", "Tendons", and "Bursae" are well presented and can be recommended to the orthopaedic surgeon. The reader cannot, of course, find in so general a book the complete details on all the subjects covered. However, there is a tremendous amount of surgical knowledge packed in between the covers. The author is to be commended for presenting such a book.

MODERN OPERATIVE SURGERY Edited by G Grey Turner Ed 2 Baltimore, William Wood and Company, 1934 In two volumes, \$16 00

The original work, which appeared in 1924, was edited by Herbert William Carson, who died while the preparation of the second edition was in progress. The task was then taken up by G Grey Turner, who has enlarged the scope to correspond to the advances and the growth in surgery. The object is to present the details of technique with the reasons for choice of operation, etc., and the author has had in view "the requirements of those who are commencing the practice of surgery." He has had the assistance of a group of eminent collaborators.

With all the books and articles written at the present time dealing with the general considerations of the conditions requiring surgical treatment, it is of practical advantage to have a work that confines itself to the technique of the procedures. It is particularly true at this time when so many new operations are being devised and frequently the technique is not sufficiently described. The necessity of considering operative measures from the standpoint of general surgical procedure is wisely emphasized, and this discussion includes anaesthesia, fitness and preparation of the patient for the operation, advisability of the operation, and a clear understanding of the results which are expected to be obtained. The operative procedures are grouped regionally as much as is possible, which makes it easy for the reader to find the special procedure which he may desire.

The portions devoted to the orthopaedic subjects and to injuries and diseases of the bones are treated under the heads of, "Conservative Treatment in Surgical Tuberculosis", by Sir Henry Gauvain, "General Orthopaedics", by R C Elmslie, "Operations on Joints", by P Jenner Verrall, "Operations on Tendons" and "Amputations", by R C Elmslie, and "Operations on Bones", by Ernest W Hey Groves. All of these men are eminent and have had wide experience in their special department of surgery.

In many of the orthopaedic operations, it may be regretted that more space could not be devoted to the description and the details of postoperative care, which is so essential to the success of any operation, but the indications for the operations and the different steps of the technique are very fully described and will be found of distinct value.

In the chapter on "Operations on Bones", in dealing with fractures, Hey Groves has discussed very completely the technique of the operation and the lines of approach to the different areas, and has paid especial attention to the description of the apparatus employed. The apparatus used in dealing with old fractures and that employed in bone traction are described and the various methods of their application are given.

The scope of this work is so extensive that any one who is accustomed to surgery will find aid in the operative procedures, both in general and special surgery. The book is a valuable addition to the surgeon's library.

A BRIEF OUTLINE OF MODERN TREATMENT OF FRACTURES By H Waldo Spiers
Baltimore, William Wood and Company, 1935 \$2 00

This little book of 125 pages is more than a "fracture primer", and yet it is not a text-book on fractures. As the title implies, it is an outline of the modern treatment. Various types of fractures, methods of traction and suspension, pieces of apparatus and methods of applying them are illustrated by simple line drawings which are, on the whole, good. It is a book which medical students and practitioners could read with benefit before attempting to treat fractures. Details of treatment of a given fracture could then be found in other treatises.

The general principles of treatment are well handled. Various methods of treating the same fracture are mentioned, but the reader has not been given enough facts to aid him in selecting the best method. The writer's statement that "the popularity of open reduction of fractures is probably based on the fact that to an extent, at least, the fee received will be proportionately larger" is a severe indictment of the medical men with whom he has come in contact.

The writer gives a "time-table of fracture after-treatment" in which the time intervals for allowing partial function and full function are rather long. Partial function is

not allowed in a clavicle for five weeks, in the lower radius for five weeks, in a phalanx for four weeks, and in spine compression for twelve to fourteen weeks after fracture. The reviewer believes that the modern treatment calls for earlier active use.

LIMBS FOR THE LIMBLESS. A HANDBOOK ON ARTIFICIAL LIMBS FOR LAYMAN AND SURGEON. By John Culbert Faries. New York, Institute for the Crippled and Disabled, 1934.

As stated in the preface, the object of this book is to give to the layman something of the history and the mechanism of the use of artificial limbs and to aid the surgeon by presenting the subject from the technician's experience. The book does not touch on the surgical field except to discuss the most practical sites for operation from the mechanic's point of view, but deals very thoroughly with the practical details of the requirements, the manufacture, and the use of the various artificial limbs. The chapters on the prostheses for the upper extremity are suggestive, for the practical solution of this problem is always difficult. The account of the early history and development of the use of prostheses and the description of the manufacture of the different types of limbs form an interesting chapter.

The result of the experience of an intelligent maker of artificial limbs and of one who has occupied himself with the training of the patient in their proper use can be of much value to the surgeon. Such a book is of interest, both to the unfortunate who is obliged to use these prostheses, and to the surgeon who prepares the limb for them.

SUMMARY OF THE TREATMENT OF FRACTURES AND DISLOCATIONS. By R. Broomhead, F.R.C.S. Leeds, Jowett & Sown, Ltd., 1935. (Sold by Henry Walker, Ltd., Briggate, Leeds, England.) 3 shillings, 6 pence.

This compendium of fracture work is frankly a student's manual based on the routine treatment of the Leeds Infirmary. The author expresses his debt to the Massachusetts General Hospital for the idea of this sort of fracture teaching and the book is very pleasing to any of us because it so closely approximates, with few exceptions, the average treatment roughly agreed on by the American workers in fractures, as expressed in the meetings of the Fracture Committee of the American College of Surgeons. This perhaps may be accepted as the American standard.

This means that the book is thoroughly modern and free from the extravagances of some of the operative treatment in England as well as here. Through the book there is very little to which one could take exception.

In this country, T fractures of the elbow are not treated by operation unless for extremely good reasons, and it is the opinion of the reviewer that the roller bandage in the treatment of metacarpal fractures has almost entirely given way to the traction method with the banjo splint. The statement as to fractures of the tibia and fibula in which skeletal traction is "occasionally" necessary hardly keeps pace with the requirements of modern treatment.

But these are matters of detail and the advice given in the book is in the main thoroughly sound. Particularly acceptable to the reviewer is the prominence given to physical therapy, especially the emphasis on active movements.

As a student's manual the book can only be approved.

REPORT OF SEVENTH INTERNATIONAL CONGRESS OF MILITARY MEDICINE AND PHARMACY. MADRID, SPAIN, MAY 29-JUNE 3, 1933. By Captain William Seaman Bainbridge. Menasha, Wisconsin, The Collegiate Press, 1934.

The purpose of these Congresses is to consider the methods of the conduct of wars, the international rules that must be obeyed, the observance of neutrality that shall govern the establishments for the care of the sick and wounded, etc. At this Seventh Congress, for the first time since its inauguration in 1921, experts in international law sat in with the military delegates, altogether a body of 1,400 representatives, delegates from

twenty-eight nations The findings of these Congresses are coming to have a bearing upon questions of compensation for injuries, whether of war time or peace time The Congress considered (1) the general principles regarding medical service in war time and their application under the new rulings of the Geneva Convention, (2) preventive vaccination in the army, navy, and air forces, (3) treatment in advanced posts of urgent surgical casualties, (4) preserved foods as a regular ration for soldiers in peace time or in the field, and (5) comparative study of the odonto-stomatological and administrative services in the different armies, navies, and air forces

Aside from the general sessions of the Congress, there was an address from the General Secretary of Red Cross Societies and a meeting, the third since its organization, of the International Office of Medico-Military Documentation and of the Second International Congress of Sanitary Aviation The promotion of good will among the military physicians of the nations of the world will, it is hoped, be one of the influences to promote a desire for universal peace

The Journal wishes to acknowledge the receipt of the following publications sent to the Editorial Department

Injuries and Their Treatment By W Eldon Tucker London, H K Lewis & Co Ltd, 1935 9 shillings

Boletines de la Sociedad de Cirugía de Rosario, I, Nums 7, 8, 9, 1934

Bulletin of the National Tuberculosis Association (New York), XXI, Nos 2, 3, 1935

Medico-Surgical Suggestions (Madras, India), III, Nos 10, 11, 1934

The Rotarian (Chicago), XLVI, No 3, 1935

La Tribuna Médica (Havana), X, Nos 234-237, 1934

Arztliche Festwochen in Wien 55 Internationalen Fortbildungskursus der Wiener medizinischen Fakultät Innere Medizin und Grenzgebiete mit besonderer Berücksichtigung der Therapie Vienna, 1934

ESTUDIO CLÍNICO Y RADIOLOGICO DE LA ENFERMEDAD DE LEGG-PERTHES-CALVÉ (Clinical and Roentgenographic Study of Legg-Perthes-Calvé Disease) Rafael Nuñez Gomez Bogotá, Editorial Minerva, 1934

After a description of the anatomy of the hip joint, the author discusses the etiology of Legg-Perthes-Calvé disease, the following factors are included trauma, infection, endocrine disorders, rickets, congenital anomalies

A chapter on pathogenesis considers aseptic and septic necrosis of the epiphysis, fractures due to compression, vasomotor alterations, and dyschondroplasia

The symptomatology of the three stages, with the diagnosis and prognosis, is discussed at length

In the chapter on the differential diagnosis the following conditions are mentioned acute arthritis, coxa vara, congenital dislocation of the hip, coxa magna, trochanteritis, juvenile deforming arthritis, fracture of the femoral neck, osteochondritis dissecans, slipping epiphysis A short outline of treatment is given

The author draws the following conclusions

1 Infantile deforming osteochondritis constitutes a well defined pathological entity, characterized clinically by its evolution and anatomic-pathologically by certain phenomena of the local calcium metabolism

2 The diagnosis is based chiefly on the roentgenograms

3 In certain cases the lesion is limited to the femoral head, while in others the acetabulum is also involved

4 The evolution of the osteochondritis in childhood may be so insidious and the symptomatology so limited that the condition may remain unrecognized

5 Articular deformities resulting from the lesion are responsible for limitation of function — Joseph A. Naranjo, M.D., Chicago, Illinois

TRATAMIENTO QUIRURGICO DE ALGUNAS LUXACIONES IRREDUCTIBLES Y REINIDENTES DE LA CADERA (Surgical Treatment of Irreducible Dislocations of the Hip in Children) Roberto Parra Bernal Bogota, Editorial Renacimiento, 1934

The conclusions arrived at by the author in this article are as follows

1 In old dislocations of the hip in children, a forced reduction should not be attempted, as there may result a fracture of the femur, an injury of the blood vessels or nerves, or muscular lacerations with resulting atrophy of the muscles and shortening of the limb

2 No success can be expected from such reduction, as the cavity of the acetabulum is deformed

3 In old traumatic dislocations with deformed acetabula, the best treatment is Lorenz's bifurcation operation

4 The same operation is recommended for recurrent congenital dislocations

5 For the treatment of old pathological dislocations with adhesions of the femoral heads, or deformities of the acetabula, the best treatment is Lorenz's subtrochanteric osteotomy

6 Lorenz's bifurcation relieves pain, deformity, and instability and also improves the claudication

7 The only defect or disadvantage of the operation is a shortening of the involved limb —Joseph K. Narat, M.D., Chicago, Illinois

MYXOSARCOMATA A. A. Thibaudeau and L. C. Kress *Am J Cancer*, XXIII, 267, Feb 1935

The authors present a series of fifty-one cases of myxofibroblastoma, forty-two of which they class as malignant tumors. There is a considerable discussion as to the source or the mucus in these tumors, and they conclude that it can be derived from various types of connective tissue. They consider that this accounts for the mucus both in these tumors and in the epithelial neoplasms.

There was a definite history of trauma in many of these cases, as an antecedent to the appearance of the tumor. The histological characteristics of the various tumors are discussed in detail, with photomicrographs. The tumors in their series appeared in various parts of the body, the head and the lower extremities were the commonest sites, with the upper extremities and buttocks as the next most common. The tumors are prone to recur after surgical excision and present metastases in a considerable number of cases. The authors had no cures among the cases in which recurrence had taken place, even by recourse to further radical surgery, and there were no cures in the cases in which the lower extremities were involved. They conclude that the myxosarcomata about the head and face respond more favorably to treatment.

Combinations of radiation and surgery were employed in most cases, although the general impression of the authors was that radiation was only rarely of benefit.

(Although the authors do not make the statement, it seems probable that the presence of mucus does not warrant classification of these tumors as separate from fibrosarcomata in general, and that the same principles of etiology, diagnosis, treatment, and prognosis apply to both groups.)—Grantley W. Taylor, M.D., Boston, Massachusetts

CHARACTERISTICS OF THE SYNOVIAL FLUID IN VARIOUS TYPES OF ARTHRITIS. STUDY OF NINETY CASES. Chester S. Keefer, Walter K. Myers, and William F. Holmes, Jr. *Arch Int Med*, LIV, 872, 1934

One hundred and twenty samples of synovial fluid from ninety patients with various types of arthritis were studied to determine the diagnostic significance of the various biological and chemical characteristics of the fluid.

An increase in the amount of synovial fluid may be the result of transudation or

exudation resulting from inflammation. Transudates into the cavities of the joints are observed under the same circumstances as they appear in other serous sacs,—that is, with increased venous pressure, decrease of plasma protein, or obstruction to lymphatic drainage.

In acute inflammatory lesions of the synovial membrane, the total cell count was increased. When the fluids were infected, the cells were commonly all polymorphonuclear. When they were not infected, the lymphocytes, monocytes, and clasmatoocytes were relatively increased. These changes are similar to those found in other effusions, infected and non-infected, of the serous sacs. In the case of tuberculous arthritis, the polymorphonuclear cells may not predominate in all cases. Guinea-pig inoculation is useful in the diagnosis of tuberculous arthritis.

The gonococcic complement-fixation test was positive in 74 per cent. of the synovial fluids from patients with gonococcic arthritis. The test was usually in agreement with that of the blood. In view of the negative results in other types of arthritis and the occurrence of falsely positive reactions, the test was of assistance in the diagnosis of gonococcic arthritis.

The Wassermann reaction of the synovial fluid was positive in two cases of syphilitic arthritis. In these cases it is usually positive in both the blood and the synovial fluid, whereas, in the cases of Charcot joints in tabes dorsalis, the reaction may be positive in the blood and negative in the synovial fluid.

The total protein content was increased above normal in both the infected and the non-infected fluids from patients with gonococcic arthritis, rheumatoid arthritis, acute rheumatic fever, and tuberculous arthritis and in the miscellaneous group of cases. The non-protein nitrogen varied with the value in the blood and was of no diagnostic significance. The sugar content varied with the presence of organisms, the number of cells, and the level of the sugar in the blood. A low sugar content did not always mean an infected fluid, but could occur as well when the number of cells was increased.—*Clark H. Heath, M. D., Boston, Massachusetts*

SERIAL RADIOGRAPHIC APPEARANCES OF A NEUROPATHIC SHOULDER-JOINT. James F. Brailsford. *British J. Surg.*, XXII, 424, Jan. 1935.

A series of four roentgenograms are presented to illustrate the successive stages seen in one patient. The roentgenograms are unusual in that the illustrations are made from positive and negative films, the one on the top of the other. The result is a cut that shows both the bones and the soft parts in their true relationship. The first roentgenogram shows a marked swelling of the soft parts, with little bone change, the second shows an increase in the disease of the soft parts and absorption of the upper end of the humerus, the third shows a massive bony shelf built on to the glenoid, and absorption of the soft tissue mass, while the final one reveals absorption of the bony shelf of the glenoid—

Ernest M. Daland, M. D., Boston, Massachusetts

BILATERAL BIPARTITE PATELLAE. Ruggles George. *British J. Surg.*, XXII, 555, Jan. 1935.

A post-mortem finding of bilateral bipartite patellae in a male of sixty-three is cited. Microscopic study showed fibrocartilage connecting the two portions of cancellous bone. However, there was a complete layer of articular cartilage surrounding each of the bony fragments. The separate fragment is usually at the superolateral angle of the patella. The condition is usually bilateral,—an important point in distinguishing the condition from a fracture.—*Ernest M. Daland, M. D., Boston, Massachusetts*

GONORRHOEAL ARTHRITIS—ITS TREATMENT BY ELECTROPYREXIA. Rodney I. Atcott and Luella E. Patterson. *California and West. Med.*, XII, 94, Feb. 1935.

The authors report on a series of eleven cases of gonorrhoeal infections, nine of which were arthritic, treated by hyperpyrexia. The electric cabinet was used and augmented by diathermy to the focal areas. A narcotic was used to promote quiet and comfort. The temperature was raised to between 103.5 and 104 degrees, as registered by an elec-

tric thermometer in the rectum. The electrodes were placed over one-fourth-inch moistened pads to insure against hot spots. The rise in temperature should not be faster than 1 degree in fifteen minutes, and the temperature is held at the maximum of not over 104 degrees for from two to four hours. The condition of the patient must be carefully watched and treatment discontinued at the first sign of exhaustion.

The gonorrheal organism is thermolabile at a temperature of 103.5 degrees and in all cases the patients improved. In seven of the arthritic cases there was complete recovery. These were the acute cases.—*Charles Lyle Hawl, M.D., Los Angeles, California*

TUBERCULOSIS OF THE NECK OF THE FEMUR *Chir. Narz. Ruchu*, VII, 157, 1934 W. Dega

The situation of a tuberculous focus in the proximity of a joint is a grave menace to the latter's integrity. Hence, the majority of surgeons are inclined to treat juxta-articular tuberculosis radically. Among the various locations of juxta-articular tuberculosis, the femoral joint should be given special consideration on account of the topographic peculiarities.

A tuberculous focus of the neck of the femur may be classified according to one of the following types:

- 1 Central—that is, situated in the spongiosa of the neck—consisting of one or several cavities filled with a necrotic deposit. It is often diffuse in the early stage, and circumscribed in the more advanced stage.

- 2 Peripheral, usually situated on the upper aspect of the neck, near the head of the femur.

- 3 Close to the greater trochanter.

- 4 Occupying the whole neck of the femur.

Of 216 cases of tuberculosis of the hip joint treated by Dega in the Orthopaedic Institute of Poznań (Poland), there were thirteen cases of tuberculosis of the femoral neck (seven occurring in girls and six in boys),—that is, 6 per cent. of the total. The age of the patients ranged from seven months to five and one-half years.

In seven cases, the tuberculous focus was situated in the lower median section of the neck, in five cases, in the center of the neck, and, in one case, the whole neck, including the greater trochanter, appeared to be involved, whereby the condition resembled that of *spina ventosa*.

The following clinical signs were observed. In the beginning there was frequently a circumscribed pain in the hip or the knee, later followed by limitation of motion in the hip joint, as regards adduction and rotation. The extent of the articular disability sometimes contrasted with that of the roentgenographic findings.

Ten cases were treated conservatively by immobilization, first with plaster-of-Paris casts and later by orthopaedic apparatus, with the following results. In one instance (central focus), transient recovery took place with a relapse after four years and subsequent coxitis. In another instance (central focus), there has been no recurrence after two and a half years. In the remaining cases, the results were negative,—that is, ending in coxitis or death from meningitis.

Three cases were treated surgically. The operation consisted of complete removal of the tuberculous foci through the postero-external intratrochanteric approach, whereby the synovial joint capsule remained intact. The joint was then immobilized until the cavity in the femoral neck became filled up with bony substance; the period of immobilization varied from several months to over a year. The end results were negative in two cases of peripheral location of the tuberculous focus,—one patient suffered a relapse after six months, the other, after twelve months. Coxitis developed in both instances. In the third case (central focus with perforation of the epiphyseal cartilage of the femoral head), there was recovery with undisturbed motion of the hip five years after the operation.

It appears that the results of the treatment depend less on the method used than on the patient's resistance, early diagnosis, and social conditions (housing hygiene, possibil-

ity of superinfection) However, there is evidence that surgical intervention is able to bring about a good result, while greatly shortening the time of treatment — *H B Thomas, M D, Chicago, Illinois*

USE OF STOCK VACCINES IN CHRONIC ARTHRITIS K K Sherwood *Northwest Med*, XXXIII, 426, 1934

The author reports the results of treatment by vaccine therapy alone of 674 arthritic patients Good results were obtained in the acute cases, or those in which the duration of illness was less than three months Women with severe symptoms improved more than men Sixty-eight per cent showed marked improvement A dilute mixed respiratory vaccine gave better results than the commercial streptococcic vaccine The reaction should give relief from stiffness and muscle spasm for about five days If this period is much shortened, the dosage should be increased by one-tenth to two-tenths of a cubic centimeter An increase in pain and stiffness indicates too large a dosage, and it should be decreased by from five-hundredths to fifteen-hundredths of a cubic centimeter The "foreign-protein reaction" indicates too large a dosage by from threefold to tenfold It may be necessary to alter the vaccine to elicit a proper response — *Charles Lyle Hand, M D, Los Angeles, California*

SYNDROME DE VOLKMANN TRAITÉ PAR ARTÉRIECTOMIE ÉTUDE HISTOLOGIQUE DE L'ARTÈRE HUMÉRALE OBLITÉRÉE (Volkmann's Syndrome Treated by Arterectomy) P Mathieu, P Padovani, R Letulle, et P Normand *Presse Med*, XLII, 1819, 1934

The authors report the case of a child five and one-half years old, who was treated for a supracondylar fracture of the humerus by flexion and application of a plaster-of-Paris cast Although there was evidence of swelling within a few days, so that the cast had to be removed, the flexion deformity of the fingers did not occur until about five weeks after the accident

At the operation performed some three and one-half months later, there was found thrombosis of the brachial artery for a distance of two centimeters just above its bifurcation This portion of the artery was resected, with almost immediate improvement in the degree of contracture of the muscles and warmth of the skin The patient was subsequently treated by traction in extension Several months later, it was noted that the hand was warm, the wrist and fingers were extended, but that the semipronation of the forearm still persisted

Histological examination of the section of the artery removed showed a typical thrombosis of the artery, with attempts at recanalization

The authors are of the opinion that the condition in this case resulted not from a superaponeurotic hematoma, but from an injury to the brachial artery, with a subsequent thrombosis The effect of this thrombosis of the artery was first necrobiosis of the flexor muscle on the anterior surface, due to interference with circulation, and a sympathetic vasoconstriction with muscle contracture, due to hypertonia

The authors, therefore, advise early operation in cases of Volkmann's ischaemia, with exposure of the brachial artery in the antecubital fossa If the artery is obviously pulsating, a simple arterial sympathectomy should be performed If there appears to be thrombosis of the artery, resection of that portion is advised — *Henry Maltch, M D, New York, N Y*

MYOSITE OSSIFIANTE PROGRESSIVE (Progressive Ossifying Myositis) Felix Masclet, A Jaubert de Beaujeu, et Ed Bloch *Presse Med*, XLII, 1823, 1934

The authors report a case of progressive ossifying myositis in a child two and one-half years old Although the condition apparently came on shortly after an acute intestinal infection, they are of the opinion that the infection was only of casual significance

The ossifying masses in each case occurred after trauma and were preceded by typical hematoma formations. The patient also presented a number of congenital anomalies, such as microdactylia, hallux valgus, hypospadias, etc.

Rocher believed that hematomata arise primarily from a panarteritis in which trauma leads to rupture of the artery. The authors are of the opinion that this condition is to be related primarily to some error in mesenchymal development.

Treatment is without avail, although some authors advise the use of x-ray, hot air, and diathermy. Surgery is contra-indicated unless it is for the palliative purpose of removing an obstruction to motion.—*Henry Milch, M D, New York, N Y*

LA DYSCHONDROPLASIE D'OLLIER (Dyschondroplasia of Ollier) André Richard, Paul-Victor Dupuis, Carle Roederer, et Robert Frovez. *Presse Med*, XLII, 1833, 1934.

Two cases of dyschondroplasia are reported in which the following characteristics were noted. The condition appeared to affect females, to be non-hereditary, and to occur in early infancy. In both cases, only one side of the body was affected and the affected limbs were characterized by shortening.

The authors are of the opinion that Ollier's dyschondroplasia is a separate entity from multiple exostoses and multiple chondromatoses, although all three are members of a group which should probably be called chondrodystrophies. The three conditions may be differentiated by the following characteristics: dyschondroplasia and chondromatosis occur in early infancy, while multiple exostoses occur later. The latter two conditions are more frequently found in the male and are bilateral, while the former condition is usually found in the female and is unilateral. In chondromatosis, chondromata occur frequently in adult life, while in the other two conditions, they are rare.—*Henry Milch, M D, New York, N Y*

CLINICAL NOTE. A DIAGNOSIS AT AUTOPSY. *Rev de la Facultad de Med (Bogota)*, II, Apr. 1934.

This report describes an unusual injury to the spinal cord following an attempt to lift a heavy weight. The patient felt a sharp pain in the lower part of the back and fell unconscious. Later he complained continually of pain in the low back. On examination, there was found an unusual condition of extreme rigidity of the muscles of the lower portion of the trunk and legs, and, on attempting to palpate the abdomen, even slight pressure resulted in marked tetanic contractions of the abdominal muscles. The patient could not flex the knees and any attempt to move the lower limbs caused the whole body to become rigid, all of the vertebral muscles were in extreme tension. Within twenty-four hours, the patient became practically rigid, even to contraction of the sphincters, and died in four days.

Autopsy disclosed no injury to the vertebral column, but rupture of the spinal cord at the junction with the corda equina, this portion was separated entirely from the cord. There was very slight hemorrhage into the cord or into the surrounding areas. There was no lesion either of bones or muscles.—*Charles Harduclé, M D, Mexico City, Mexico*

FRACTURES OF THE NECK OF THE FEMUR, RECENT AND OLD. A REPORT OF 631 CASES. Melvin S. Henderson. *Southern Med J*, XXVII, 1032, 1934.

The pathology, diagnosis, reduction, retention, and restoration of these fractures are discussed, and a review of 631 cases is reported. Four hundred and ten patients with old fractures were dismissed without any surgical measures having been advised for various reasons. There remained 221 patients for whom treatment was advised. Forty-five of these did not accept the advice and, therefore, there were 176 patients who were given treatment.

Fifty-one fresh fractures were treated by manipulation, twelve manipulations were

done on late fractures, and 113 open operations were done. There were six deaths, 3.4 per cent of this group. The mortality in all cases seen, whether treated or untreated, was 14.6 per cent.

Of the fifty-one cases of fresh fracture treated by closed methods, thirty-six were available for the study of end results. Of these thirty-six cases, excellent bony union was obtained in 66.6 per cent. These cases were treated by Whitman's abduction method.

Of thirty-six cases in which bone-graft operations were performed, excellent results were obtained in 69.8 per cent. The author's technique of bone grafting is described. Beef-bone pegs or screws were used in nineteen cases. In thirteen of these cases, or 81 per cent, the results were excellent.

The Whitman reconstruction operation was used in twenty-three cases. The end results are known in nineteen cases: excellent, 31.5 per cent; good, 36.8 per cent; failures, 31.5 per cent.

Brackett's operation performed in five cases, gave satisfactory results in all. In five cases of fresh fracture, the Smith-Petersen nail was used, with resulting bony union in all. —*Fred G. Hodgson, M.D., Atlanta, Georgia*

SYPHILIS OF THE CLAVICLE. REPORT OF FIVE CASES. H. Earle Conwell. *Southern Medical J.*, XXVIII, 11, Jan. 1935.

These cases presented varying symptoms and roentgenographic appearances. The latter often seemed worse than the complaints of the patients would lead one to suspect. Pain was the usual symptom, this was often much worse at night, preventing sleep. Tumefaction was present. Two of the five cases showed bilateral involvement. A history of syphilis was obtained in only 40 per cent of the cases. All five cases responded to antiluetic therapy. In such cases the differential diagnosis is made from malignancy, tuberculosis, chronic osteomyelitis, and Paget's disease. Many of these cases are operated upon unnecessarily. —*Fred G. Hodgson, M.D., Atlanta, Georgia*

HABITUAL DISLOCATION OF THE SHOULDER JOINT. A NEW METHOD OF OPERATIVE TREATMENT. V. G. Weinstein. *Soviet Surg.*, VI, 447, 1934.

The author calls attention to the structure and reinforcement of the anterior aspect of the capsule of the shoulder joint. Basing his studies on previous anatomical investigations in human and simian cadavera, he points to the importance of the glenoid ligament which reinforces obliquely the anterior portion of the capsule. In human shoulders, this ligament is absent in about 16 per cent of cases. In all cadavera in which this ligament is absent, a dislocation of the humeral head is easily produced. The author believes that the habitual dislocation is due either to the absence of this ligament or to a congenital weakness in it. His operation, therefore, is based on a recreation of this ligament.

An approach is made through the sulcus between the deltoid and the pectoralis muscles. The tendon of the long portion of the biceps is reached just above the insertion of the tendon of the pectoralis major into the humerus. The tendon of the long biceps is cut at this level and the distal end is sutured to the tendon of the pectoralis major and the periosteum. A small incision of the capsule is then made slightly above the sulcus intertubercularis humeri and the proximal portion of the cut biceps tendon is pulled out through the incision. The humerus is then rotated externally and another incision is made in the capsule just below the insertion of the subscapularis. The tendon of the long biceps is pulled through this incision, so that it remains within the capsule, and the cut end of the biceps tendon is attached under a periosteal bridge below the lesser tuberosity. The incision over the sulcus intertubercularis humeri is closed and an ordinary dressing is applied. All motions are allowed in four to five weeks.

This operation has been performed on nine patients, all of whom have returned to their normal occupations, which in a few instances consist of heavy physical work. —

Emanuel Kaplan, M.D., New York, N.Y.

The Journal of Bone and Joint Surgery

OSTEOGENIC SARCOMA *

BY WILLIS C CAMPBELL, M D , MEMPHIS, TENNESSEE

Strictly speaking, there is only one primary malignant bone tumor,—osteogenic sarcoma, for other tumors arising in bone—such as myelomata—are derived from tissues residing in bone (marrow, blood vessels, etc) that are not capable of producing bone or any tissue found in the evolutionary process of bone production. Osteogenic sarcoma is of more frequent occurrence than any tumor in bone. Of eighty-six primary malignant bone tumors studied by the author, fifty-seven were osteogenic, twenty-one were Ewing's, four were myelomata, and four were extraperiosteal fibrosarcomata. There is much doubt as to the origin of these tumors, even of Ewing's tumor. Jaffe and others believe Ewing's tumor to be of osteogenic origin, which, if proved, would materially increase the percentage of osteogenic sarcoma. A giant-cell tumor, in which malignant variants occur, is now thought to be osteogenic in origin,—that is, an osteoclastoma. Therefore, with the possible exception of some rare tumors, there are only two varieties of primary tumors that are of undisputed origin,—extraperiosteal fibrosarcoma and myeloma.

Osteogenic sarcoma is composed of a combination of two or more of the elements found in the evolutionary process of bone production. In the past, the predominating elements have been employed to designate the pathological entity, but, as there may be different elements in different portions of the tumor and many combinations of various types of cells and tissues, much unnecessary confusion has existed. The diagnosis should first be made as osteogenic sarcoma, after which any qualifying term may be employed to define the individual characteristics. There is no systematic or arbitrary method of classification of osteogenic sarcomata from the standpoint of the roentgenogram, pathological examination, anatomical location, or clinical course. However, a large percentage may be divided for description as follows —

* Read at the Annual Meeting of the American Academy of Orthopaedic Surgeons, New York, N Y , January 14, 1935

- 1 Evolutionary (chondromyxosarcoma and other varieties) primary and secondary
- 2 Osteoblastic
- 3 Osteolytic—in patients under twenty-five years of age
- 4 Osteolytic (medullary)—in patients over twenty-five years of age

Even in the more pronounced types, there may be much difficulty in classification,—in those composed of cartilaginous and myxomatous elements, there may also be considerable bone production, and there may be excessive osteoblastic and osteolytic changes at different places in the same tumor. From a study of the roentgenograms or the pathological specimens, any two skilled observers would not wholly agree in the classification of any group of tumors. The opinion of any one experienced in this field may change on subsequent investigation, also, tumors that are apparently of primary origin are at times proved to be metastatic.

The term "evolutionary" is applied to two groups—primary and secondary—as the clinical symptoms and signs are quite similar, but the pathology, as revealed by the microscope, varies. Many tumors are composed of cartilage in various stages of development, with myxomatous and fibrous tissue, for which reason Geschickter classifies them as chondromyxosarcomata. Some are composed of spindle cells, which leads to the pathological diagnosis of fibrosarcomata, although Geschickter and others do not believe that fibrosarcomata can arise from any of the elements which are observed in the formation of bone. Three cases in the author's series apparently arose from the epiphyseal cartilage and were composed of embryonic cartilage cells with areas of calcification, and con-

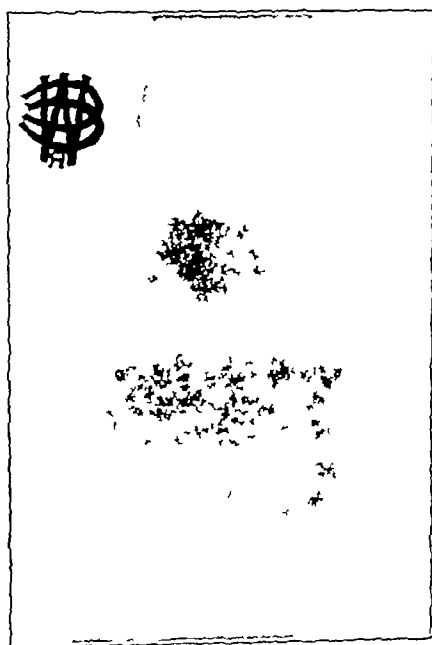


FIG 1-A



FIG 1-B

Table I, Case 1 Chondromyxosarcoma. Roentgenograms showing only condensation in the bone with extensive tumefaction externally.

formed to the tumor described by Ziegler as petrifying sarcoma and by Geschickter and Copeland as chondroblastic sarcoma. No attempt is being made to make the subject more confusing by the addition of a new term "evolutionary", but, as a practical surgeon, the author cannot use a pathological term that does not define the nature of the tumor.

PRIMARY EVOLUTIONARY OSTEOGENIC SARCOMA

Primary evolutionary sarcoma, when composed of cartilaginous and myxomatous tissue (chondromyxosarcoma), may be invisible in the roentgenogram in the early stages and the shaft of the bone may apparently be normal. The tumor, however, can usually be palpated and

TABLE I
PRIMARY EVOLUTIONARY OSTEOGENIC SARCOMA

Name	Age (Years)	Sex	Symptoms	Trauma	Duration	Location	Treatment	Result
H. J.	21	M	Pain, tumor, temperature	Yes	6 months	Right tibia	Amputation, X-ray, Coley's toxin	Died in 2½ months
W. B.	14	M	Pain, loss of weight	Yes	2 months	Left femur	X-ray	Died in 3½ months
T. R. E.	51	M	Tumor, pain	Yes	30 months	Left fibula	Amputation	Living and well 6 years later
C. F. W.	38	M	Tumor	No	24 months	Chest wall	Partial excision	Died in 3 years
L. H.	19	M	Pain, tumor	Yes	8 months	Right tibia	Amputation	Living and well 6 years later
C. R. W.	44	M	Pain	Yes	20 months	Sacrum	None	Died in 35 months
E. B. L.	42	M	Loss of weight	Yes	3 years	Left shoulder	X-ray	Living 6 months later
R. C.	16	M	Pain	No	6 months	Right femur	Amputation, Coley's toxin, X-ray	Living 4 months later
A. E.	16	M	Pain, tumor	Yes	6½ months	Left tibia	Amputation	Living 1 year later
H. E. B.	22	M	Pain, tumor	No	3 months	Right tibia	Disarticulation, amputation	Living 3 years later
B. H.	16	M	Pain, tumor	Yes	3 months	Left tibia	Coley's toxin	Living 34 years later
G. H.	17	M	Pain, tumor	Yes	8 months	Left tibia	Amputation, Coley's toxin, X-ray	Died in 11 months
A. C.	38	M	Pain, tumor	Yes	12 months	First metatarsal	Amputation	Recent case
A. F.	50	F	Pain	Yes	3 years	Neck of right femur	Excision, X-ray	Recent case

surrounds the bone. In most instances, the roentgenogram will demonstrate a definite shadow of the tumor in the soft parts and, in many cases, areas of ossification may be observed scattered irregularly throughout the mass or in spicules at right angles to the shaft. When such areas of ossification become excessive, the tumor may be designated as osteoblastic osteogenic sarcoma, the differentiation being of degree rather than of kind. In the case of the tumor described as chondroblastic, the roentgenogram may also demonstrate no abnormality in the early stage, but later there appear opaque areas of mottling, disintegration of the shaft, and invasion of the epiphysis. Sun-ray formation of bone with spicules of bone at right angles to the shaft may also be present. Three of the tumors in this class are composed largely of adult hyaline cartilage and are defined by Phemister as chondrosarcomata. They do not deserve a special classification, but are much less malignant than other types of osteogenic sarcoma.

The so called lipping or outgrowth of the periosteum at the junction of the shaft and the tumor is frequently observed in all types of osteogenic sarcomata, but is by no means pathognomonic as some observers would



FIG 2

Table I, Case 1 Specimen after amputation. Note the extensive growth external to the bone.



FIG 3

Table I, Case 7 Chondrosarcoma of three years' duration Patient refused amputation.

lead us to believe, as such changes are more pronounced in Ewing's tumor. However, lipping is most suggestive of malignancy.

Discussion of Cases

Of the fourteen patients described in Table I, eight are living, two of these eight patients, however, are recent cases.

In Case 1, an operation was performed for a cartilage displaced three months previously, but without relief of symptoms. When the patient was first observed, there was some doubt as to the diagnosis. The roentgenogram showed opacity within the bone and swelling of the soft parts, suggesting tumor. At operation, the gross tissue was found to be gray, semi-cartilaginous in appearance, and quite typical of sarcoma. Microscopic section at once proved the tumor to be a chondromyxosarcoma.

In Case 2, the diagnosis was somewhat difficult, as the location of the tumor in the neck and head of the femur is rather unusual. One diagnostic feature was present in this case which we have often noticed in osteogenic sarcomata,—traction, which usually allays symptoms in inflammation, greatly aggravated the symptoms.

In Case 4, a very large tumor, the size of a grapefruit and of cartilaginous consistency, was located on the chest wall. On attempted excision, it was found that the ribs and intercostal spaces were involved to such a degree that complete excision was impossible. From the history of this tumor, it was thought that possibly the condition was originally a



FIG 4-A

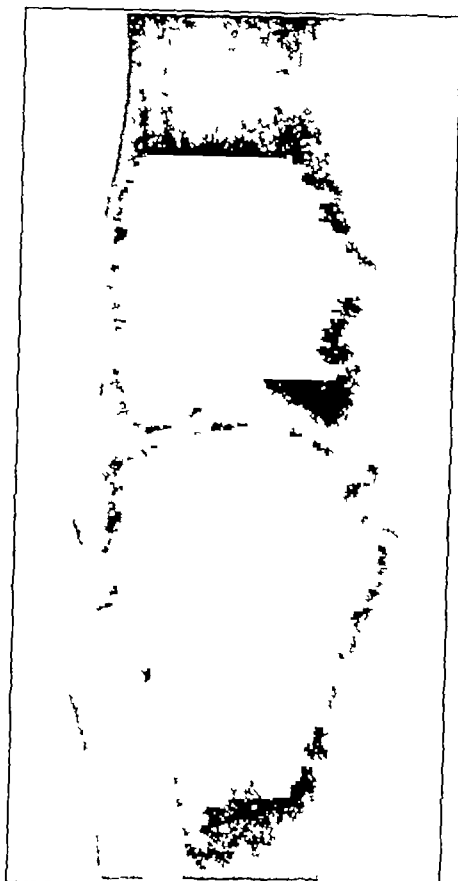


FIG 4-B

Table I, Case 11 Chondroblastic osteogenic sarcoma Patient living three and one-half years after amputation Note formation of trabeculae of bone at right angles to shaft

benign chondroma with late malignant changes, but, since only five years elapsed from onset to death from metastasis, it should be regarded as primarily malignant and placed in this group

In Case 3, over six years have elapsed since amputation, although this man was fifty-one years of age at the time of operation and the tumor was of thirty months' duration

The patient in Case 5, aged nineteen years, is also living six years after amputation, but in this case the tumor was of eight months' duration and there was a history of two previous attempts to excise it locally The tumor was composed of more advanced cartilage than is found in the average specimen, a type of tumor which has been described by Phemister as chondrosarcoma and which is relatively less malignant

Case 7 is also a case of chondrosarcoma, as demonstrated by biopsy The tumor has existed in the upper portion of the humerus for three years with gradual increase in size, the symptoms have recently become more exaggerated Excision or amputation has been declined Roentgenographically, this tumor very closely resembles osteogenic sarcoma at this location in the young, but the age, consistency, duration, and histology exclude such a possibility

In three cases (Cases 2, 10, and 13) the tumors were chondroblastic. The patient in Case 10, a man, aged twenty-two years, gave a history of a small tender mass in the upper outer aspect of the right tibia, first noticed three months previous to examination. This mass had grown very slowly, but two months from the time of the onset it had become more painful. A roentgenogram was taken in the Out-Patient Department of the Baptist Hospital and, as no abnormality was observed, the patient was told to return in one month, when it was found that the tumor had grown more rapidly and that the symptoms were aggravated. A roentgenogram at this time demonstrated pathology suggesting malignancy. Amputation was done three months after onset of symptoms. In nine months there was a recurrence in the stump and a hip-joint amputation was performed. A comparison of the roentgenograms before and at the time of the first amputation showed astounding changes in so short a space of time. Biopsy and amputation were indicated one month earlier, which would have probably given a better chance for recovery, the author, however, did not



FIG 5-A



FIG 5-B

Table II, Case 16. Secondary chondromyxosarcoma, beginning in old bone lesion of twelve to fifteen years' duration, probably Paget's disease.



FIG 6

Table II, Case 19 Secondary osteogenic "fibrosarcoma", beginning at site of old osteoma of ten years' duration

nite onset—four to eight months after the onset of symptoms

see the patient at that time and amputation was done immediately after his first examination This patient is living and well three years after the second amputation

Case 11, a boy, aged sixteen years, had pain and enlargement of the upper extremity of the tibia of three months' duration Amputation was performed, followed by x-ray and Coley's toxin The patient is now living and well three years after amputation

Case 12, a boy, aged seventeen years, had a tumor in the same location as in Case 11, but of indefinite

TABLE II
SECONDARY EVOLUTIONARY OSTEOGENIC SARCOMA

Case No	Name	Age (Years)	Sex	Symptoms	Trauma	Duration	Location	Treatment	Result
5	Mrs C R C	38	F	Pain, tumor	No	6 months	Mandible	Excision	Living 4 years and 2 months later
6	G W	58	M	Pain, deadness	Yes	12 to 15 years	Left femur	Amputation	Died in 7 months
7	Mrs F C	31	F	Pain, tumor	No	5 years	Left femur	Excision	Died in 17 months
8	B C G	38	M	Pain	No	15 months	Left fibula	Amputation	Living 15 years later
9	B S	28	F	Pain, tumor	No	12 months	Right femur	Amputation	Living 7 years later
10	Mrs C C C	26	F	Pain, dysfunction	Yes	9 years	Right femur	Excision	Died in 8 days

SECONDARY EVOLUTIONARY OSTEOGENIC SARCOMA

These sarcomata arise at the sites of lesions that are usually benign,—low-grade osteitis, Paget's disease, chondroma, and osteochondroma. These tumors probably do not undergo malignant degeneration, but arise from dormant embryonic rests within the lesions. There is evidence of some local process having existed in a more or less quiescent state for a long period of time,—five or ten years, or more. As in the primary type, the histopathology is not uniform, more often it is that of a chondromyxosarcoma. Some of the characteristics of this tumor may be gathered from a study of Table II.

Discussion of Cases

From their roentgenographic appearance, the primary lesions in Cases 17, 19, and 20 were diagnosed as benign osteochondromata. There had been rapid increase in size with pain. In each case, the roentgenogram demonstrated a degenerative lesion within the tumor. Cases 17 and 20 were doubtful as to malignancy until local excision was attempted, amputation at the hip was declined in each case and death ensued. The patient in Case 19 is living and well seven years after amputation.

Case 15 presents a rather typical tumor of the jaw in which there have been two excisions, with one recurrence. The patient is still living four years after the second excision and is apparently healthy after a plastic bone-graft operation.

Case 16 is most interesting. A white man, aged fifty-eight, gave a history of having received a slight injury to the left thigh when playing tennis twenty years previously. Since that time, there had been occasional pain, at times rather severe. This patient was first examined on November 28, 1926, and stated that since February the pain had become very intense and boring, but was indefinite in character. On inspection, there was an enlargement on the anterolateral aspect of the thigh, just above the knee joint. On palpation, a definite mass

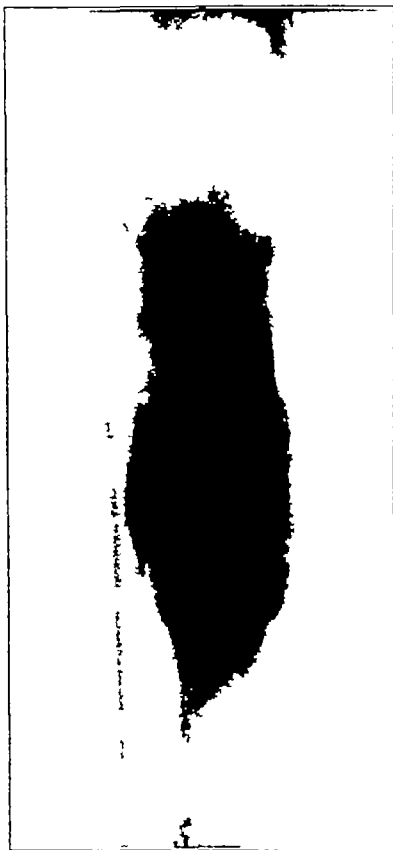


FIG 7

Table III, Case 29. Typical osteoblastic osteogenic sarcoma of childhood.

of osseous consistency, continuous with the femur, could be felt. The roentgenogram demonstrated an enlarged and sclerotic femur with some breaking through and degenerative changes in the lower third. The evidence was suggestive, but by no means definitely characteristic, of malignancy. At biopsy, the tissue removed from the medulla resembled low-grade inflammatory tissue in which there were some osteoid changes. There was no tumefaction exterior to the bone. The pathologists differed, but, at the end of three weeks, the tumor was growing rapidly and amputation was performed. A general metastasis followed, with death at the end of four months. After amputation, there was no question as to malignancy. A recent report from the Sarcoma Registry states that this tumor is a chondromyxosarcoma, arising in local Paget's disease.

TABLE III
OSTEOBLASTIC OSTEOGENIC SARCOMA

Case	Name	Age (Years)	Sex	Symptoms	Trauma	Duration	Location	Treatment	Result
L R		9	F	Pain, tumor	Yes	2 months	Right femur	Amputation	Died in 6 months
V C		14	F	Pain, stiffness	Yes	10 months	Right femur	X-ray	Died
C M		7	M	Pain, tumor	No	3 months	Left femur	X-ray	Died
Miss T		18	F	Pain, temperature	No	4 months	Right femur	Amputation	Died in 10½ months
M R		12	F	Pain, tumor	No	9 months	Left femur	Amputation	Died in 8 months
Mrs W H		29	F	Pain, tumor	No	6 years	Left femur	Amputation	Died in 6½ months
O N		18	M	Pain, tumor, temperature	Yes	9 months	Right femur	None	Died
R C S		19	M	Pain, tumor	Yes	3 years	Right femur	None	Died
L H		12	M	Pain	No	2 months	Left tibia	Amputation	Died in 12 months
E C		21	F	Tumor, pain, fluid	Yes	1 year	Right femur	None	Unknown
L T		36	M	Pain, tumor	Yes	4 years	Right femur	None	Unknown
F R T		36	M	Pain	No	2 years	Right femur	Amputation, Coley's toxin	Died
C M		12	M	Pain, tumor, limp	No	5 months	Left femur	Amputation, X-ray	Died
S A		21	F	Pain, tumor	No	10 months	Right femur	Amputation	Died in 16 months
J F		20	M	Pain, tumor	No	8 months	Left femur	None	Died
R S		74	F	Pain, tumor	No	4 months	Left tibia	None	Died
M K		18	F	Pain, swelling	No	4 months	Left knee	Amputation, X-ray	Died in 17 months
R H		13	F	Tumor, pain, limp	No	3 months	Left femur	Disarticulation	Living 3 months later
M E		12	F	Pain	No	4 months	Left femur	Amputation	Died

In Case 18, the patient is living and well fifteen years after amputation. In two attempted excisions, the tumor was shown to be lobulated with fibrous tissue separating the lobes of typical hyaline cartilage. After the second operation, there was an early recurrence and rapid growth. After amputation, this tumor proved to be a chondrosarcoma. For years the tumor had probably been a benign chondroma.

OSTEOBLASTIC OSTEOGENIC SARCOMA

This type of tumor signifies the preponderance of bone production or bone formation. In children, as is true of all osteogenic sarcomata, the so called sun-ray appearance is more pronounced and often resembles an old-fashioned goose-quill pen, the tumor also usually surrounds the shaft more uniformly. In adults, the tumor is more irregular, the distribution of new bone is more scattered, and evidence of the sun-ray spicules is not so pronounced. Other points are brought out in Table III.

Discussion of Cases

Case 29, a boy, aged twelve years, demonstrates the more common type frequently observed in children, showing spicules at right angles to the shaft.

Case 32, a man, aged thirty-six years, shows the condensing type which involves the shaft with little, if any, periosteal change.

Case 34, a woman, aged twenty-one years, demonstrates irregular osseous formation in an asymmetrical tumor.

Cases 32 and 34 represent types which are more often observed in adults.

Case 25 illustrates the occurrence of the tumor in the middle of the shaft, an unusual site.

Case 31, a man, aged thirty-six years, shows a low-grade tumor of



FIG 8

Table III, Case 32. Osteoblastic osteogenic sarcoma of type found in the adult.



FIG 9

Table IV, Case 43 Early stage of osteolytic sarcoma in a boy, aged eighteen years Note the central destruction

four years' duration which may possibly be secondary to a benign tumor

In this series of nineteen cases, fifteen patients have died of metastasis, three cannot be located, but there is every reason to presume that they have died, as no treatment was employed, one amputation is too recent to consider the result Geschickter and Copeland give a mortality in such cases of 75 per cent, about twenty-five per cent remaining well five years or more after amputation The mortality in the author's series is 100 per cent, but this discrepancy may be due to a difference in classification and the status of the cases in question on admission

OSTEOGENIC OSTEOLYTIC SARCOMA

From a clinical aspect, osteogenic osteolytic sarcomata may be divided according to age into two groups (1) children and young adults, (2) mature adults, usually above the age of twenty-five No arbitrary age limit is made

1 *Children and Young Adults*

Osteolytic sarcoma in patients under twenty-five is more often found between the ages of ten and twenty years Fever and leukocytosis are not uncommon, with at times an enlargement of the lymph glands which drain the affected area There is some pain in the early stage before the cortex disintegrates, after this the pain is low-grade, evidently due to the relief of intra-osseous pressure In other types of sarcoma which increase in size within the unyielding shaft and periosteum, intra-osseous pressure is excessive with characteristic intense boring pain



FIG 10

Table IV, Case 45 Osteolytic osteogenic sarcoma in youth.

The nine cases in the author's series are summarized in Table IV.

Fracture occurs in a large percentage of the cases,—probably in 50 per cent. The process begins in the medulla of the metaphysis from the endosteum and is very cellular, often with the formation of osteoid tissue throughout. There is such an enormous blood supply that the term "bone aneurysms" has been applied in the older literature. The process is at first so insidious and rapid that, by the time the patient is first examined, there has been complete disintegration of bone surrounded by a mass of soft-tissue tumor. This may be so extensive that the entire extremity of the bone has disappeared.

On physical examination, there is a definite regular mass surrounding the bone, which is not especially tender to pressure. The occurrence is by far more frequent in the upper third of the humerus. Of the nine cases in this series five were located in the upper third of the humerus, one in the upper portion of the femur, one in the lower part of the femur, one in the upper third of the tibia, and one in the mid-third of the clavicle. In the early stages, the x-ray may show central disintegration only, with a cavity

which may resemble a cyst, but usually, when the patient is first observed, there is complete disintegration of the shaft without osseous reaction on the part of the bone or periosteum. However, after a pathological fracture, there may be some evidence of callus. The appearance is so characteristic that diagnosis can usually be made by the roentgenogram alone. The mortality in this group, as was seen in the osteoblastic group, is very high. In fact, all of the patients have died of metastasis within from five months to one year after observation or amputation, except the patient in Case 48 whose case was reported before the Memphis and Shelby County Medical Society by the author's colleague, Dr. Joseph I. Mitchell. The pathology is never uniform in this group, the tumor being composed largely of primitive embryonic cells, osteoid tissue, and blood vessels.

2 *Mature Adults*

Osteolytic osteogenic sarcoma is to the writer an entirely different tumor in adults and conforms to the old description of medullary or en-

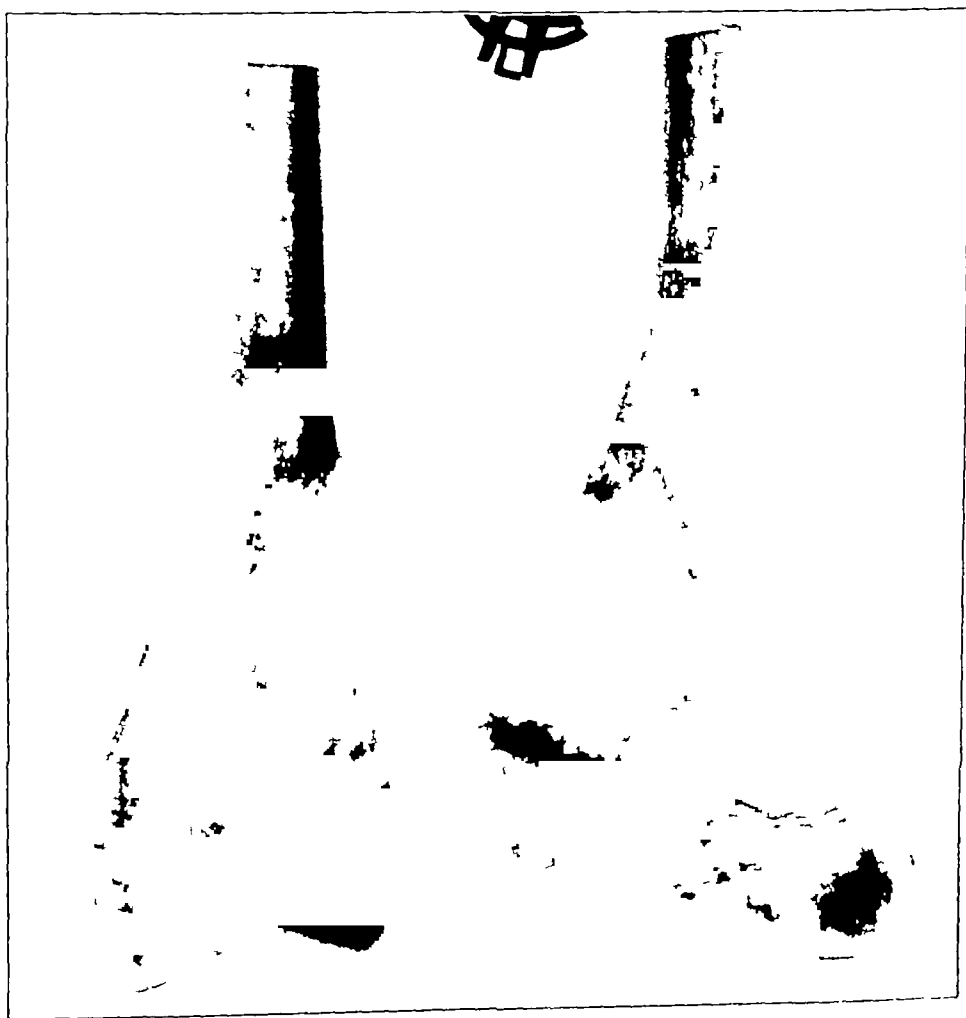


FIG 11

Table IV, Case 48. Osteolytic osteogenic sarcoma in the femur of a child, aged twelve years.

TABLE IV

OSTEOLYTIC OSTEOGENIC SARCOMA (PATIENTS UNDER TWENTY-FIVE YEARS)

Case No	Name	Age (Years)	Sex	Symptoms	Trauma	Duration	Location	Treatment	Result
40	M J	9	F	Pain, tumor	No	1 year	Right clavicle	Excision	Died in 6 months
41	J B S	33	M	Pain, tumor	Yes	7 months	Right humerus	Excision	Died
42	E E H	22	M	Pain, stiffness	Yes	8 months	Right tibia	None	Died
43	S S	18	M	Pain, tumor	Yes	8 months	Left humerus	Excision, Coley's toxin	Died in 5 months
44	T M	10	M	Tumor	Yes	6 months	Left humerus	X-ray	Died in 16 months
45	J E P	24	M	Pain, tumor, loss of weight	No	3 months	Left humerus	Amputation	Died in 5 months
46	V B	15	M	Pain, tumor	Yes	6 months	Right humerus	None	Died
47	M Q	17	F	Pain, tumor, temperature	Yes	3 months	Left femur	Amputation	Died in 11 months
48	J R. B	12	M	Pain, swelling	Yes	5 months	Right femur	Amputation	Living 4 months later

TABLE V

OSTEOLYTIC OSTEOGENIC SARCOMA (PATIENTS OVER TWENTY-FIVE YEARS)

Case No	Name	Age (Years)	Sex	Symptoms	Trauma	Duration	Location	Treatment	Result
49	H L	22	M	Tumor	Yes	5 months	Left tibia	Excision	Living 12 years later
50	Mrs. W N	33	F	Tumor	?	?	Left femur	None	Died
51	Mrs W M	35	F	Tenderness, lump	No	6 months	Left tibia	Amputation, X-ray	Died in 18 months
52	E C	30	M	Tenderness, dysfunction	No	1 year	Left femur	Amputation, Coley's toxin	Living 3 years and 7½ months later
53	C B	40	F	Pain, loss of weight	No	4 years	Left femur	X-ray	Died in 4½ months
54	L F	39	F	Swelling	Yes	5 months	Left tibia and right ilium	Excision	Living 11 years later
55	W H	44	M	Pain, tumor	No	3 years	Ischium and pubis	X-ray	Died in 12 months
56	Mrs S M	49	F	Pain	Yes	2½ years	Left femur	Excision	Died in 4 months
57	Mrs W H	42	F	Pain, tumor	No	8 months	Left femur	Recent case	Recent case.

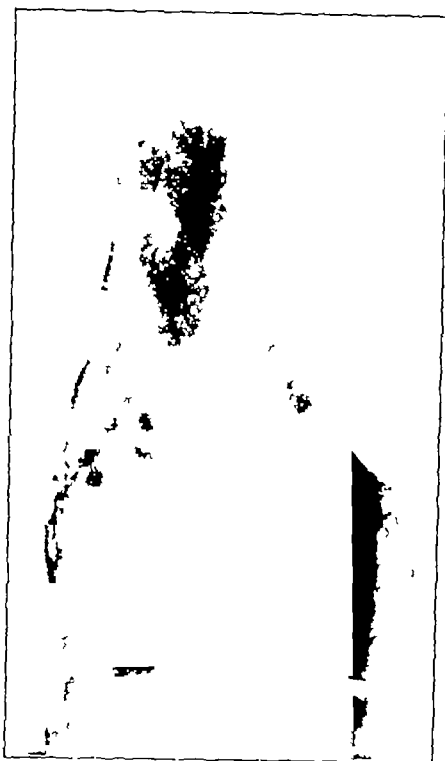


FIG 12-A



FIG 12-B

Table V, Case 52 Osteolytic osteogenic sarcoma in an adult Note slight resemblance to giant-cell tumor

dosteal sarcoma by Bloodgood and others. They are not so malignant as those found in the young and, like evolutionary osteogenic sarcoma, the pathology is not uniform. Therefore, such a class may be debatable, although, on account of the prognosis, this group is undoubtedly of clinical and practical importance. The onset and evolution of this tumor is very slow and insidious. Geschickter suggests the probability that it is secondary to some other process. The location in the metaphysis is the same as in the osteolytic type in the young, but the tumor remains largely confined within the shaft for a much longer period of time. There is often, however, a penetration of the shaft with irregular tumefaction externally, but the author has never observed in this series the extensive tumefaction surrounding the disintegrated shaft which is seen in the osteolytic type in the young. Also the occurrence as regards the bones involved is different. In the young, the osteolytic type was found more frequently in the upper portion of the humerus, whereas in the adult type this bone was not involved in a single case, the distribution being tibia, three, lower third of femur, two, upper portion of femur, two, pelvis, one. This type has often been mistaken for giant-cell tumor, which is found largely on the side of the epiphyseal disc, but there is not as a rule the multilocular cystic appearance observed in giant-cell tumor. Also the cortex is more frequently penetrated by osteolytic osteogenic sarcoma. Bone cysts are more regular and usually involve almost the entire cortex, they never break through except where there is a pathologi-

cal fracture and then they do not involve the soft parts. Also there is more general expansion of the shaft. The clinical course can be illustrated best by a consideration of the clinical behavior, as demonstrated in Table V.

Case 52 was somewhat suggestive of giant-cell tumor, but, as the cortex had been penetrated and there was excessive growth external to the bone, malignancy was suspected. The pathological diagnosis of the pathologist, Dr. Hamilton, was fibrosarcoma, which was confirmed by the Sarcoma Registry. Case 54 in this series is also questionable as the roentgenogram is suggestive of a giant-cell tumor, however, there was no difference of opinion of the pathologists although the patient is living eleven years after amputation.

The histopathology in four cases was "fibrosarcoma", in one, "osteosarcoma", in one, "round-cell sarcoma", and in one, in which the patient died of metastasis, "giant-cell tumor variant". In one case, in which the tumor was located in the ischium and pubis, no biopsy was made as the tumor was inoperable. Two of the four patients in whom the diagnosis of fibrosarcoma was made died of metastasis and two are living, eleven and four years, respectively, after operation. Of the nine cases reported, three patients are living and well after eleven, twelve, and four years, respectively, one is living, but the operation has been performed too recently to permit the ultimate result to be determined. (The terms "osteosarcoma" and "round-cell sarcoma" are now obsolete.)

END RESULTS

Of the fifty-seven cases of osteogenic sarcoma, there are ten in which the patients have lived a sufficient length of time to estimate the probable end results. Of these, only four are comparatively young individuals: Case 5, aged nineteen years, Case 10, aged twenty-two years, Case 11, aged sixteen years, and Case 49, aged twenty-two years.

There were thirteen osteogenic sarcomata in patients under sixteen years of age,—one was evolutionary, seven, osteoblastic, and five, osteolytic. Of the 13 patients, twelve have died, and in the remaining case it is too early to estimate the outcome.

Therefore, from the analysis, the chances are that any malignant tumor of bone in a child is osteoblastic, osteogenic osteolytic, or an Ewing's tumor. In a survey from the Registry of Bone Sarcoma of sixty-seven patients who are living and well at the end of five years or over, there are twelve children with osteogenic sarcoma under the age of sixteen years, but, in the cases which the author has observed personally, the results in osteogenic sarcoma in children have not been as satisfactory as above stated.

The results obtained in the entire group of fifty-seven patients are much better than those of one or two decades ago, when there were no living patients to consider except mature adults.

LATE OR TARDY ULNAR-NERVE PARALYSIS

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Lesions of peripheral nerves associated with fractures at the elbow are usually classified as

- 1 Primary neuritis
 - a due to simple contusion
 - b complicating
 - (1) internal epicondylar fractures
 - (2) supracondylar fractures
 - (3) dislocation of the elbow joint,
- 2 Secondary neuritis complicating
 - a fractures of the lower end of the humerus
 - b dislocation of the elbow joint,
- 3 Late or tardy ulnar neuritis

The primary lesion occurs at once at the time of the injury and is recognized immediately or when the splint and dressings are removed. The secondary lesion arises gradually during the weeks of osseous repair, appearing three to four weeks after the initial trauma, the neuritis is due to involvement in fibro-osseous formation or enclosure between bony fragments. A secondary neuritis may be due to injudicious treatment,—*i. e.*, the use of forced passive movements of the elbow in the first few weeks after injury (Platt).

The late or tardy lesion appears many years after the injury is incurred.

REVIEW OF LITERATURE

It is of historical interest that Duchenne, the noted authority on muscular atrophy and particularly that of muscles of the hand, confessed to Panas that he had diagnosed a case of late ulnar-nerve palsy as spinal amyotrophy, but had later corrected his error. Attention was first directed to the subject by Panas, who presented a paper to the Académie de Médecine in 1877, "to draw the attention of the Academy to a cause of ulnar-nerve palsy hitherto having escaped observation." To his Clinic came a shoemaker, aged forty, with evidence of an ulnar-nerve paralysis appearing thirty years after an injury to the elbow, cubitus valgus deformity, and palpable enlargement of the involved nerve within the ulnar groove.

The foundations of our present knowledge date, however, from 1898 when Albert Mouchet in his Paris thesis first clearly described this clinical entity, and in 1899 when Broca and Mouchet gave the first complete exposition of the pathogenesis of a small group of injuries accompanying fractures at the lower end of the humerus.

Prior to 1900, cases were also recorded by Bowlby, Weber, Schreuer, Seeligmüller, Bernhardt, Sengensse, Guillemain and Mally, and Curtis Sherren, in 1908, reported twenty-two cases from the literature, noting further contributions by Oppenheim, Bruns, Huet, Colin, Batten, Turney and Corner. In the more recent literature, we find the work of Peltesohn, Staffel, Redard, Murphy, the first American contributor (1914), Hunt, Adson, Buzzard, Lusena, Dean Lewis and Miller, Brickner, and Lewin, with noteworthy contributions by Mouchet, Miller, and Platt.

ETIOLOGY

In any large series of recent fractures of the elbow, the three main groups of humeral fractures will be found to occur in the following proportions: supracondylar, 45 per cent; external condylar, 30 per cent; and internal condylar, 25 per cent.

The elbow joint provides the greatest proportion of the nerve lesions associated with simple fracture. In the large series of dual injuries reported by Lewis and Miller in 1922, 60 per cent of the fractures involved the lower third of the humerus. However, such dual injuries need not be anticipated as being over-common. In Platt's series of 552 fractures about the elbow joint, there were only thirteen cases, or 3 per cent, of nerve injuries,—twelve of the ulnar nerve and one of the median nerve.

Various types of fractures have been described by the early writers as antedating late or tardy ulnar-nerve palsy, a name applied to this entity by Hunt in 1916, but it must be remembered that many of these early cases were recorded either before the advent of roentgenography or at a time when roentgenographic technique and interpretation were as yet inadequate. In Mouchet's original case, the paralysis followed a fracture of the external condyle, and, since then, he has dealt with ten additional cases, each one associated with fracture of the external condyle. Platt also believes that, in the external condylar fractures, the one form of nerve complication is the classical late ulnar-nerve paralysis, with rare exceptions, such as an occasional fracture of the olecranon process or fracture of the radial head. He reported six cases in 1926 and three cases in 1928, each one associated with an old fracture of the external condyle. According to Miller, in the vast majority of cases, the fracture is usually a complete separation of the external condyle. He presents ten cases of late ulnar-nerve palsy, all associated with old fractures of the external condyle.

A careful study of many of the cases reported by the older writers, with associated diagnoses of "enlargement of the internal condyle", "fracture at the elbow joint with cubitus valgus", or "old injury to the internal condyle", makes the investigator feel that many of these cases represented old fractures of the external condyle, while a review of the roentgenograms which accompany the reports reveals frequent misinterpretations.

Late ulnar-nerve palsy has been ascribed rarely to old infectious

arthritis of the elbow joint (Sherren, Weber, Shelden) In Murphy's case, a small osteomalike growth was found beneath the ulnar nerve, associated with an ununited external condylar fracture In one of Hunt's cases, symptoms were due to the pressing of a small cystic tumor on the ulnar nerve, while Learmonth reports a case associated with sarcoma of the ulnar nerve The writers have recently observed a case of late ulnar palsy associated with recurrent hemarthroses in an hemophiliac of twenty-two

The external condylar fracture is not the exciting factor *per se* in the production of late ulnar-nerve paralysis, but it is the cubitus-valgus deformity which this fracture precedes, that is the direct causative agent The reported cases of late ulnar palsy related to external condylar fractures always evidence some grade of cubitus-valgus deformity

While the predetermining injury is usually incurred in childhood, this is not always so Shelden, in presenting twenty-two cases observed at The Mayo Clinic, noted the occurrence of symptoms of pressure on the ulnar nerve in one patient, aged sixty-two, who had had an indefinite injury to the elbow at the age of fifty-two, and in another, aged sixty-one, with bilateral ulnar neuritis, who had dislocated his left elbow at the age of twenty-six, and his right elbow at the age of twenty-eight

A close scrutiny of the cases reported in the last two decades, accompanied by a careful and complete study of the roentgenographic evidence, bears out the accuracy of Mouchet's observations,—*i e*, that the late ulnar-nerve lesion is ordinarily a sequela of fracture of the external condyle with cubitus-valgus deformity, and that, although late involvement is not impossible with the other types of fracture about the elbow, it is the exception

CLINICAL PICTURE

The clinical picture embraces three phases

- 1 The fracture in childhood,
- 2 The latent period, rarely less than ten years,
- 3 The stage of ulnar neuritis

1 The typical case involves an old fracture of the external condyle, the fracture line running obliquely into the elbow joint This is a familiar injury in childhood and is rarely associated with acute ulnar-nerve involvement The broken fragment is displaced laterally and forward and is turned on its axis by the attached extensor muscles Union occurs usually by fibrous-tissue formation, and subsequent function at the elbow joint is usually good Insidiously, during the ensuing years, there is an increase in the carrying angle beyond the normal angle of fifteen degrees, with the development of a cubitus-valgus deformity, due first to the displaced external condylar fragment and later to the interference of growth on the outer aspect of the humerus because of irregular epiphyseal growth (Scudder, Speed, Stimson) It is the comparative enlargement on the inner aspect of the elbow that misled many of the early writers to attribute the cause of these cases to internal condylar injury or fracture

2 The latent period,—namely, that period between the initial injury and the appearance of nerve involvement, during which nothing abnormal is noted except, possibly, the increasing carrying angle—is not less than ten years in 75 per cent of cases (Platt), it is noticed between the twentieth and thirtieth year following the injury in 40 per cent of cases (Miller), and it may be as long as forty to fifty years

3 Early in the stage of ulnar-nerve involvement, there may be progressive subjective symptoms, both motor and sensory. Pain may be present along the distribution of the ulnar nerve, excited and exaggerated by movements at the elbow joint

This is associated with or followed closely by trophic disturbances atrophy on the inner aspect of the forearm (flexor carpi ulnaris and the inner portion of the flexor digitorum profundus), wasting of the short muscles of the little finger (opponens, abductor, and flexor brevis) that make up the hypothenar eminence, and of the interosseous spaces (involvement of the two inner lumbricales and all the interosseous muscles), and the appearance of a marked depression between the base of the thumb and the second metacarpal bone (adductor pollicis and the deep portion of the flexor pollicis brevis)

Gradually there is loss of epicritic sensation on the ulnar side of the forearm, wrist, and hand, including the entire fifth finger and inner half of the fourth finger, while protopathic sensation is lost over an area which is always smaller than this. There is usually some loss of the sensation of deep touch (Romanis)

Paresis and paralysis of the musculature in the forearm and hand follow, with the ultimate development of a clawlike deformity (*main en griffe*)

PATHOGENESIS

It was first pointed out by Mouchet that, as a result of the cubitus-valgus deformity, the nerve is compelled to take a longer course around the olecranon process, over which it becomes stretched in the manner of a bowstring. Abnormal tension becomes a factor, with repeated trauma during each movement of flexion. A study of the clinical records shows that the symptoms of ulnar palsy frequently appear after a period of increased activity, as in sport or occupation. There is gradual thickening of that part of the nerve in the ulnar groove with fusiform swelling and the development of one or more so called "neuromata"

A contributing factor is the impingement of the olecranon process against the medial condyle by the increasing valgus deformity, so that the ulnar groove becomes but a shallow depression and the nerve is readily dislocated from its bed and exposed to trauma. The same condition may result if there is present a congenitally shallow ulnar groove with an extremely lax nerve sheath or arcuate ligament

Adson describes the sequence of events as follows: "With repeated slight trauma, such as that due to bruising or to stretching of the nerve

over bony prominences, small hemorrhages in the perineurium and endoneurium result, causing inflammatory reactions and the deposit of scar tissue. As the scar tissue tends to contract, many of the fibers become strangulated and are eventually destroyed, resulting in a gradual and progressive atrophy of the nerve."

The fusiform swelling is free and readily displaced from the groove, because the site of injury (external condyle) is far removed from the ulnar nerve, and because perineuritis rarely occurs.

In two of the recorded cases in which the diseased portion of the nerve had been excised during surgical intervention (Sherren), microscopic studies showed the presence of an interstitial neuritis with irregular areas of sclerosis in the perineurium and endoneurium. In the sclerosed patches there was well marked atrophy of the nerve fibers.

DIAGNOSIS

There should be no difficulty in making the diagnosis. The late or tardy appearance of ulnar-nerve involvement of a progressive nature ten or more years after an injury to the elbow in childhood, in a patient with a cubitus-valgus deformity, who has recently been exercising this member to a greater degree than ever before, is almost pathognomonic of fracture of the external condyle with late ulnar-nerve palsy. The x-ray findings are conclusive. Mouchet writes "A careful observer might be struck by the presence of three signs: ulnar-nerve palsy, cubitus valgus, and deformity of the external condyle. This is characteristic enough, when it is observed but once, to be recorded as an old fracture, without the aid of radiography."

Paralysis of the ulnar nerve must be differentiated from such lesions of the cord as anterior poliomyelitis, progressive muscular atrophy, syringomyelia, intramedullary tumors, amyotrophic lateral sclerosis, and meningomyelitis. The lesions which affect only the anterior horns, or the anterior horns and lateral columns, are easily differentiated by the absence of sensory changes and the sparing of some muscles supplied by the ulnar nerve. Such diseases as syringomyelia and intramedullary tumors present dissociated sensory changes and evidence of involvement of the pyramidal tracts in the lower extremity. The latter finding is likewise true of meningomyelitis and extramedullary tumors.

Ischaemic paralysis and Volkmann's contracture may be differentiated by the absence of sensory changes limited to the distribution of the ulnar nerve, the induration of the muscles, vascular disturbances, and the absence of the reactions of degeneration (Pollock and Davis).

Local factors—such as hypertrophic arthritis, the pressing on the nerve of an osteoma, cyst, or lipoma, and malignant growth of the nerve—must be excluded (benign growths rarely interfere with conduction). Cervical rib must be ruled out by a careful clinical survey and x-ray studies. Russell Hunt stresses the close similarity of "the hypothecar type of neural hand atrophy", stating that the differential diagnosis

should not be difficult with a careful consideration of the strictly neural distribution of the atrophic paralysis, the absence of sensory symptoms, and fibrillary tremors. Occupational atrophies must be excluded.

Recurrent dislocation (ulnar nerve) with symptoms of delayed neuritis, with or without a history of trauma, can be easily differentiated by the shorter latent period and the absence of cubitus-valgus deformity. If of traumatic etiology, the injury most frequently involves the ulnar groove, decreasing its depth and increasing the laxity of the nerve sheath or arcuate ligament. When associated with external condylar fracture, the picture of classical late ulnar neuritis is prominent.

PROGNOSIS

While it is true that the percentage of cases of late ulnar-nerve paralysis is small when compared to the total number of external condylar fractures—the latter comprise about 30 per cent of the fractures of the lower end of the humerus in childhood—the number of cases that do arise indicates the necessity of early attention by surgeons in order to prevent the possible late sequelae of this type of fracture. Miller does well to suggest that fracture of the external condyle of the humerus, occurring most often in childhood, should be operated on if the loose fragment cannot be accurately reduced by manipulation, because the growth deformity is apt to result in a cubitus valgus which may lead in later years to delayed ulnar neuritis.

If the ulnar nerve is involved, it is the duty of the surgeon to relieve the tension on the ulnar nerve as soon as possible. If the nerve is not markedly involved, and the causative factors are removed, an excellent result may be anticipated.

Subjective symptoms may disappear in as early as a few days. The order of muscle recovery in ulnar-nerve lesions is flexor carpi ulnaris, flexor digitorum profundus, and, lastly, the small hand muscles which recover very slowly (Bénisty). Sensory functions recover to a variable and indefinite degree. A large number of patients may show but little sensory recovery when motor recovery has already begun.

TREATMENT

Operative treatment, to relieve the nerve from tension and shorten its course, is indicated in all cases.

Simple liberation of the nerve in its bed (first performed by Protherat on Mouchet's case, but without success) is an inadequate procedure as it does not remove the etiological factors.

The method of gouging out a new groove by removing a wedge-shaped piece of bone—as practised by Broca, Sengennse of Bordeaux, and Guillemain and Mally—is not to be recommended, because of the danger of recurrent involvement of the ulnar nerve in the fibro-osseous formation.

The choice of operation lies between supracondylar osteotomy, as advised by Mouchet, and anterior transplantation of the ulnar nerve to a

position in front of the internal condyle, first performed by Roux of Lausanne, the method most commonly and successfully employed today. The nerve may or may not be introduced into an intramuscular bed constructed either by division of the superficial fibers of the forearm flexors arising from the internal condyle or by the detachment and turning down from the condyle itself of a tongue-shaped muscular flap. The nerve may be enveloped in its new bed in a layer of transplanted aponeurotic fascia.

A conservative attitude is advisable. If the ulnar-nerve paralysis is

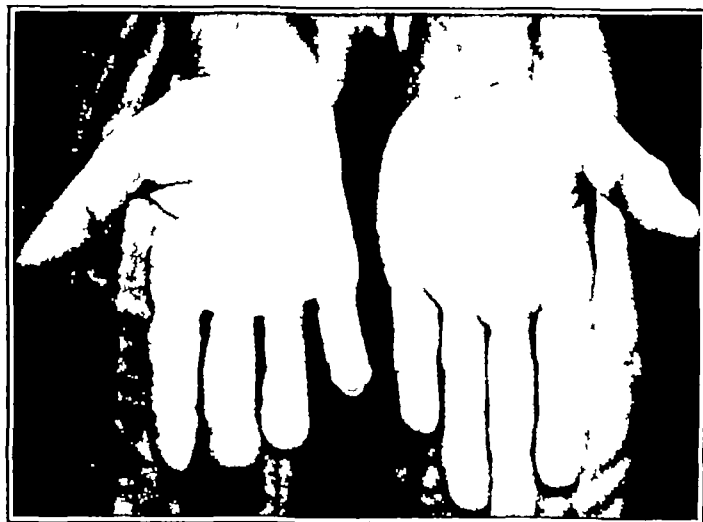


FIG 1

Note wasting of hypothenar eminence and interosseous spaces and marked depression between the base of the thumb and second metacarpal bone. Note also the partial flexion of the fourth and fifth fingers of the right hand.



FIG 2

is early and incomplete, anterior transposition is sufficient to effect a cure. Even if the ulnar palsy is quite advanced, if direct stimulation of the nerve above the fibrous swelling gives evidence of the transmission of some nerve impulses through the "neuroma", the conservative plan is to be adhered to,—*i e*, anterior transplantation of the nerve with vigorous postoperative physiotherapeutic measures.

The radical procedure of nerve resection and end-to-end anastomosis of the healthy ends must be resorted to when the nerve destruction is complete. The result in such cases is always conjectural.

CASE REPORT

P. S., a male, aged thirty, a cook, complained of numbness and tingling sensations on the inner aspect of the right forearm and hand, fifth finger, and the inner portion of the fourth finger, associated with weakness and wasting of the right hand. This had first been noticed five years previously and had been growing progressively worse. The patient recalled having been told that he had incurred a fracture of the right elbow joint at the age of two and one-half years (twenty-two and one-half years prior to the appearance of the present complaints), without resultant dysfunction. He stated that he had noted increasing prominence of the inner portion of his right elbow during the past few years.

Examination revealed a definite right cubitus-valgus deformity. A small, non-tender mass was palpable in the right ulnar groove. There was diminished epicritic and protopathic sensation, with deep touch preserved, on the inner aspect of the right forearm and right hand, fifth finger, and inner portion of the fourth finger, associated with wasting of the musculature on the inner portions of the forearm and hypothenar eminence. There was marked prominence of the interosseous spaces and the hollow between the base of the thumb and the second metacarpal bone (Fig 1). There was marked weakness of the grip of the right hand and inability to abduct and adduct the fingers and to flex the metacarpophalangeal joints. Froment's prehension sign was present. There was a partial flexion deformity of the fourth and fifth fingers, more marked in the case of the latter. Motions involving other muscles supplied by the ulnar nerve were present, but impaired. Reactions of degeneration were present in the intrinsic muscles of the hypothenar eminence,—the interossei and lumbricales.

There was a definite increase in the carrying angle on the right side with cubitus-valgus deformity (Fig 2).

The roentgenographic study revealed an old fracture of the external condyle of the right humerus, the fragment displaced forward and upward without bony union (Fig 3). All laboratory studies, including serological tests, were negative.

A diagnosis of late ulnar-nerve paralysis seemed justified, following a careful exclusion of all other possible etiological factors.

An operation was performed on October 25, 1934, by one of the authors (A. J. D.). The nerve was exposed by an incision midway between the internal condyle and the olecranon process of the right humerus. The part of the ulnar nerve within the ulnar groove was found to be the seat of a fusiform swelling (Fig 4). The neuroma was firm, smooth, and regular in outline and there was no gross evidence of inflammatory process either of the nerve or in the surrounding tissues.

Transplantation of the nerve, after mobilization, to a position anterior to the internal condyle was performed and the nerve was placed in a muscular bed by detaching a portion of the pronator teres from the internal condyle, placing the nerve beneath it, and resuturing the detached portion of the muscle to the condyle (Fig 5).

Early motion was encouraged. The patient was uncomfortable during the first two days only, experiencing lancinating pain along the course of the right ulnar nerve. Four days after operation, the patient stated that he no longer was conscious of the

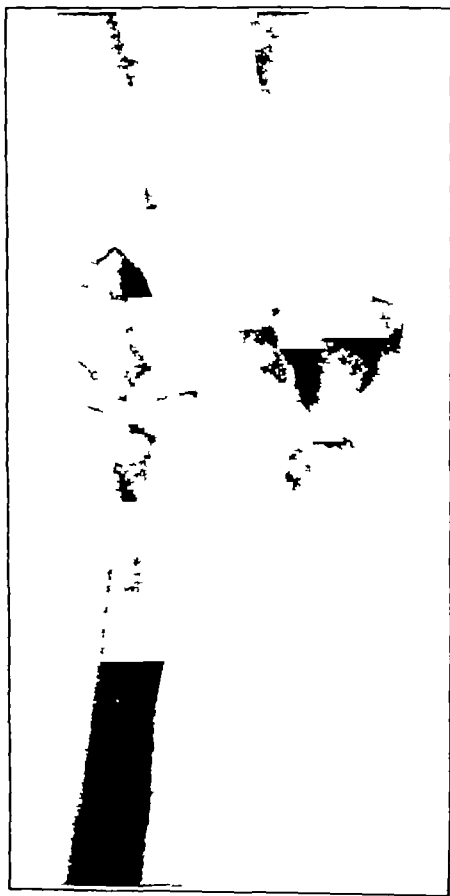


FIG 3

Fracture of the external condyle, the fragment being displaced forward and upward with non-union. Note cubitus-valgus deformity.

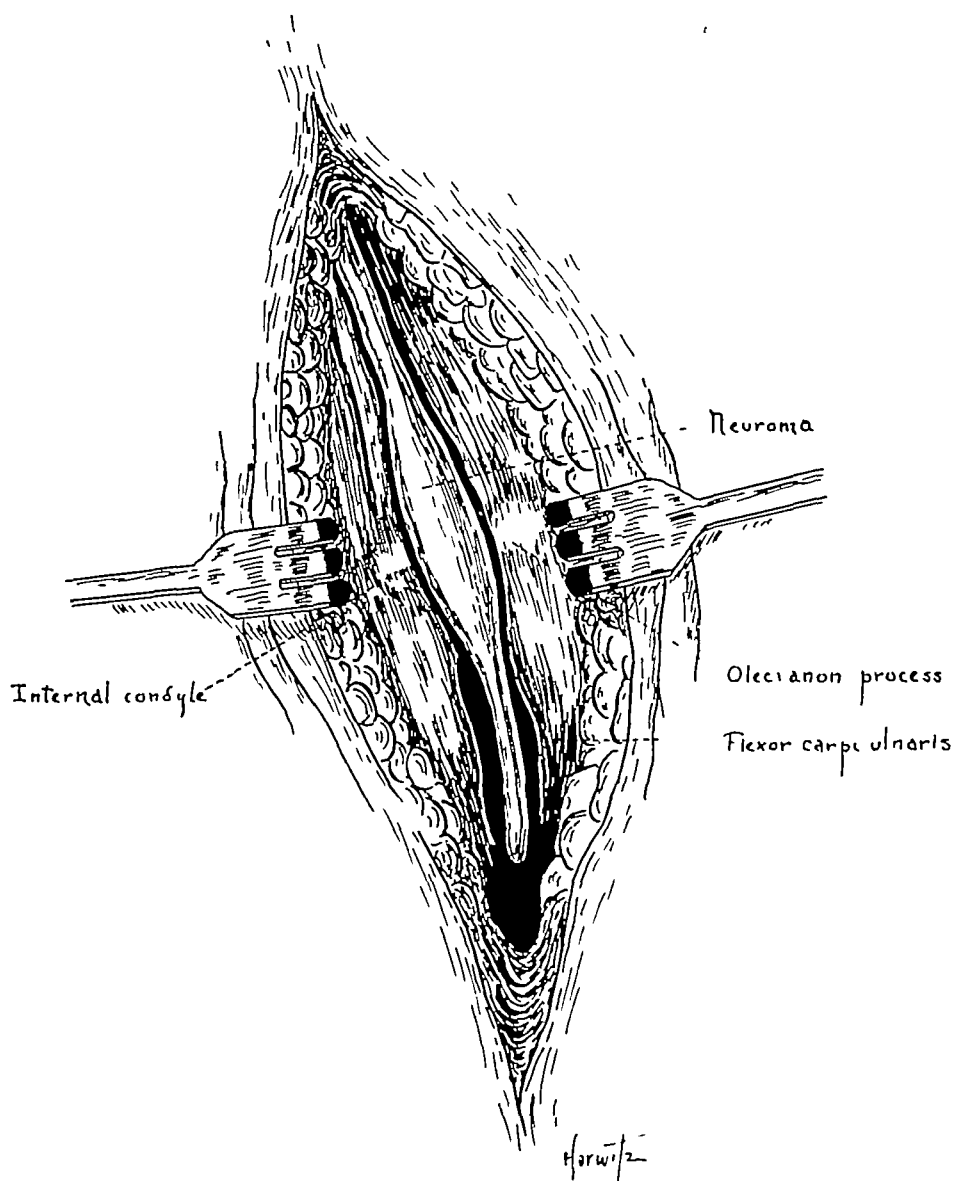


FIG 4

Fusiform swelling of the nerve in the ulnar groove

tingling sensation and that the sensation of numbness was diminishing. On the fifth day, it was noted that the patient could almost fully extend the fourth and fifth fingers voluntarily. The improvement in the sensory and motor functions was progressive during the following two weeks, with disappearance of the reactions of degeneration. With the use of proper physiotherapeutic measures and carefully guided exercises, a complete recovery is anticipated.

There is but one other case of late ulnar neuritis in the records of the Jefferson Hospital for the past fifteen years, which is presented briefly with the permission of Dr Thomas A. Shallow.

W. H., a male, aged thirty-five, complained of the recent onset of numbness in the fifth finger and inner portion of the fourth finger of the right hand and pain in the region of the right elbow. He gave a history of a compound fracture of the right elbow at the age of ten (twenty-five years prior to the onset of the present symptoms).

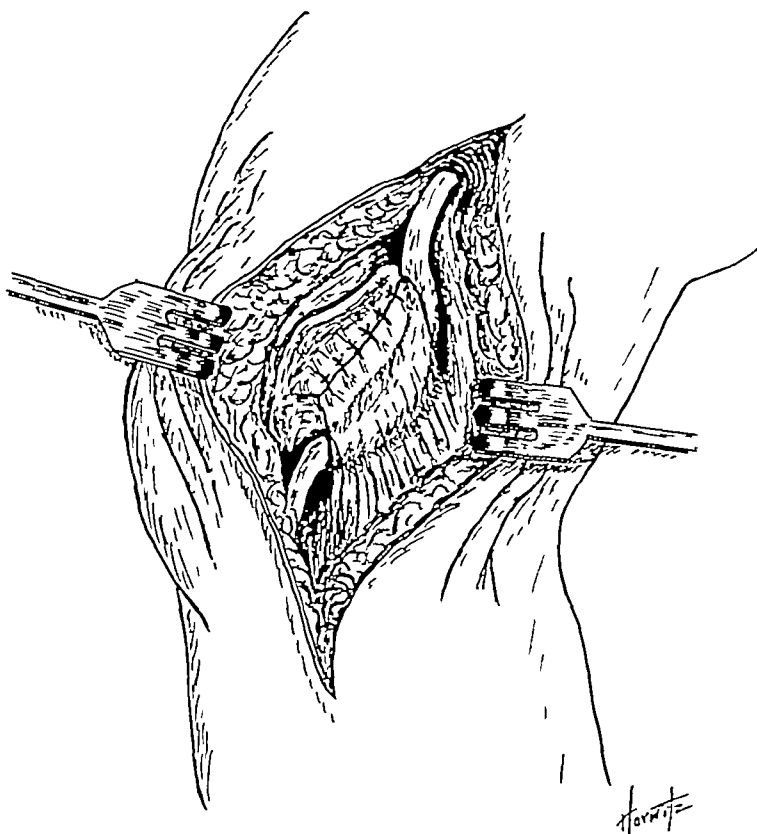


FIG 5

Showing the ulnar nerve transposed anterior to the interior condyle and placed within its muscular bed.

Examination revealed diminished sensation over the fifth finger, inner side of the fourth finger, and the hypothenar eminence of the right hand, with early wasting of the intrinsic muscles of the hand supplied by the ulnar nerve.

The roentgenographic report was as follows: "There is an old fracture of the external condyle with evidence of spur formation on the anterior external border of the bone." The roentgenograms themselves are not available.

An operation was performed on November 30, 1929, by Dr. Charles F. Nassau. The ulnar nerve was released and transposed anteriorly. A notation by the resident physician states that the part of the nerve in the ulnar groove was "heavier and thicker than the rest of the nerve" (fusiform swelling). There is no record of the patient's progress after the operation.

DISCUSSION

We do not consider these two cases as a representative series. Since the entity of chronic ulnar-nerve palsy was described, over 100 cases have been recorded in the American and foreign literature. Although many of the early cases were misrepresentations, the large series presented in the past two decades makes the writers feel that the occurrence of this condition should not prove to be uncommon in large surgical clinics.

RÉSUMÉ

1 The classical picture of late ulnar neuritis, occurring ten or more years after an injury to the elbow joint, usually in childhood, with subsequent valgus deformity, is pathognomonic of an old fracture of the external condyle with malunion or non-union

2 The lesion of the ulnar nerve is a tension or friction neuritis, due to the increasing distance that the nerve must traverse with the progressive cubitus-valgus deformity, so that it becomes "bow-strung" over the olecranon process

3 The pathological lesion is an intraneural fibrosis, evidenced as a fusiform swelling or "neuroma"

4 The prognosis is good if the nerve is relieved of tension and its course shortened by anterior transposition to the flexor surface of the internal condyle, before it has become hopelessly destroyed

5 The prophylaxis of these late sequelae to external condylar fractures of childhood is open reduction and fixation, if the fragment cannot be accurately reduced by manipulation

BIBLIOGRAPHY

- ADSON, A W The Surgical Treatment of Progressive Ulnar Paralysis Minnesota Med , I, 455, 1918 (Also in Collected Papers of the Mayo Clinic, X, 944, 1918)
- BATTEN, F E Ulnar Neuritis, with Fusiform Enlargement of the Nerve, Occurring Fifteen Years after Injury to the Elbow Brain, XXVIII, 587, 1905
- BENISTY Quoted by Pollock, L J, and Davis, Loyal (Am J Surg, XVII, 301, 1932)
- BERNHARDT, M Die Erkrankungen der peripherischen Nerven 2 Aufl, I Theil, S 428 Wien, Alfred Hölder, 1902
- Über Medianuslähmung als Spätfolge einer Ellenbogengelenkverletzung Neurol Centralbl, XXIX, 178, 1910
- BOWLBY, A A Injuries and Diseases of Nerves and Their Surgical Treatment, p 255 Philadelphia, P Blakiston, Son & Co, 1890
- BRICKNER, W M Late Ulnar Nerve Palsy Following Elbow Fracture in the Adult J Bone and Joint Surg, VI, 477, Apr 1924
- BROCA, A, ET MOUCHET, A Complications nerveuses des fractures de l'extremite inferieure de l'humérus Rev de Chir, XIX, 701, 1899
- BRIÛS, L Ueber die Verschiedenheit der Prognose der Plexus- und Nervenstammlähmungen der oberen Extremität Neurol Centralbl, XXI, 1042, 1902
- BRIÛS, PAUL Die Lehre von den Knochenbrüchen, S 459 In Deutsche Chir, Lief 27 Stuttgart, Ferdinand Enke, 1886
- BUZZARD, E F Some Varieties of Traumatic and Toxic Ulnar Neuritis Lancet, I 317, 1922
- COHN, ISIDORE Observations Based on a Study of Injuries to the Elbow Arch Surg III, 357, 1921
- COHN, M Über die Ätiologie der Ulnar-Lähmungen nach Ellbogentraumen Zentralbl f Chir, XXXI, 1400, 1904
- CURTIS, B F Traumatic Ulnar Neuritis—Transplantation of the Nerve J Nerv and Ment Disease, XXV, 480, 1898
- GRECOIRE, RAYMOND Paralyse tardive du nerf cubital a la suite d'une fracture du condyle externe de l'humérus Bull et Mem Soc Nat de Chir, L, 232, 1924
- GUILLEMAIN, A, ET MAILL, F Compression du nerf cubital par un cal vicieux du coude paralyse et reaction de degeneration Dé-enclavement Guérison Congrès Français de Chir XIII 676 1899

- HUET Névrites professionnelles du nerf médian et du nerf cubital chez un ouvrier menuisier porteur d'une ancienne fracture du coude Arch de Neurol, IX, 531, 1900
- HUNT, J. R. The Neural Atrophy of the Muscles of the Hand, without Sensory Disturbances A Further Study of Compression Neuritis of the Thenar Branch of the Median Nerve and the Deep Palmar Branch of the Ulnar Nerve Rev Neurol and Psychiatry, XII, 137, 1914
- Tardy or Late Paralysis of the Ulnar Nerve A Form of Chronic Progressive Neuritis Developing Many Years after Fracture Dislocation of the Elbow Joint J Am Med Assn, LXVI, 11, 1916
- JONES, SIR ROBERT, AND LOVETT, R. W. Orthopedic Surgery Ed 2 New York, William Wood & Co, 1929
- LEARMONTH, J. R. Three Cases of Tumor Involving a Peripheral Nerve Surg Clin North America, XII, 1001, 1932
- LEWIN, PHILIP Delayed or Tardy Ulnar Palsy Surg Clin North America, V, 1077, 1925
- LEWIS, DEAN, AND MILLER, E. M. Peripheral Nerve Injuries Associated with Fractures Ann Surg, LXXVI, 528, 1922
- LUSANA, GUSTAVO Le paralisi tardive del nervo cubitale successiva a fratture dell'estremo distale dell'omero Chirur g d Org di Movimento, VI, 139, 1922
- MILLER, E. M. Late Ulnar Nerve Palsy Surg Gynec Obstet, XXXVIII, 37, 1924
- MOUCHET, ALBERT Fractures de l'extrémité inférieure de l'humérus avec radiographies Thèse de Paris Paris, G Steinheil, 1898
- Paralyses tardives du nerf cubital à la suite des fractures du condyle externe de l'humérus J de Chir, XII, 437, 1914.
- MURPHY, J. B. Neuroma of Ulnar Nerve, the Result of Trauma Incident to Fracture at Elbow Clin John B Murphy, III, 375, 1914
- OPIENHEIM, H. Lehrbuch der Nervenkrankheiten für Ärzte und Studierende 2 Aufl, S 329 Berlin, S Karger, 1898
- PANAS Sur une cause peu connue de paralysie du nerf cubital Arch Gén de Méd, II, 5, 1878
- PAYE, ERWIN Ueber Läsion des Nervus ulnaris bei Verletzungen am Ellbogengelenk, ein Beitrag zur Lehre von den Nervenläsionen bei Traumen des Ellbogengelenkes Deutsche Ztschr f Chir, LIV, 167, 1899
- PELTESOHEN, SIEGFRIED Ueber Cubitus valgus mit sekundären Störungen im Gebiet des Nervus ulnaris Ztschr f orthop Chir, XVII, 246, 1906
- PIATT, HARRY The Pathogenesis and Treatment of Traumatic Neuritis of the Ulnar Nerve in the Post-Condylar Groove British J Surg, XIII, 409, 1926
- On the Peripheral Nerve Complications of Certain Fractures J Bone and Joint Surg, X, 403, July 1928
- On the Peripheral Nerve Complications of Fractures and Dislocations of the Elbow In The Robert Jones Birthday Volume, p 195 London Oxford University Press, 1928
- POLLOCK, L. J., AND DAVIS, LOYAL Peripheral Nerve Injuries Am J Surg, XVII, 301 1932
- Peripheral Nerve Injuries, p 339 New York, Paul B Hoeber, Inc, 1933
- RIGDARD, M. P. Du traitement de la paralysie du nerf cubital consecutive aux fractures anciennes de l'extrémité inférieure de l'humérus, chez l'enfant Congrès Français de Chir, XXIII, 992, 1910
- ROMANIS, W. H. C., AND MITCHNER, P. H. The Science and Practice of Surgery Ed 4, I, 365 Baltimore, William Wood & Co, 1933
- ROUTIER Discussion Bull. et Mém Soc Nat de Chir, I, 235, 1924
- SCUDDER, C. L. The Treatment of Fractures With Notes upon a Few Common Dislocations Ed 10 Philadelphia, W B Saunders Company, 1926

- SEELIGMULLER, ADOLPH *Lehrbuch der Krankheiten der peripheren Nerven und des Sympathicus, für Aerzte und Studierende*, S 275 *In Wredens Sammlung kurzer medizinischer Lehrbücher*, Band V, Abt I Braunschweig, Friedrich Wreden, 1882
- SENGENSSE, B *Compression du cubital par un cal vicieux du coude, réfection de la gouttière épitrochléo-olécraniennne, guérison* *Ann de la Pehelin de Bordeaux*, V, 641, 1897-1898
- SHELDEN, W D *Tardy Paralysis of the Ulnar Nerve* *Med Clin North America*, V, 499, 1921
- SHERREN, JAMES *The Distribution and Recovery of Peripheral Nerves Studied from Instances of Division in Man* *Lancet*, I, 809, 1906
Remarks on Chronic Neuritis of the Ulnar Nerve, Due to Deformity in the Region of the Elbow-Joint *Edinburgh Med J*, XXIII, 500, 1908
Chronic Neuritis of the Ulnar Nerve Due to Deformity in the Region of the Elbow, Treated by Resection of the Damaged Portion of the Nerve *Proc Roy Soc Med*, II, Clin Sect, p 142, 1908-1909
- SCHREUER Quoted by Weber
- SOUQUES, ET BUREAU, YVES *Deux cas de paralysie tardive du nerf cubital consécutive à une fracture du condyle externe de l'humérus* *Rev Neurol*, I, 202, 1926
- SPEED, KELLOGG *A Text-Book of Fractures and Dislocations With Special Reference to Their Pathology, Diagnosis, and Treatment* Ed 2 Philadelphia, Lea & Febiger, 1928
- STAFFEL *Über die Spatläsion des Nerv ulnaris nach Verletzungen der Elbogengegend* *Zentralbl f Chir*, XLI, 1500, 1914
- STIMSON, L A *A Practical Treatise on Fractures and Dislocations* Ed 8 Philadelphia, Lea & Febiger, 1917
- TURNER, AND CORNER, EDRED Quoted by Sherren
- WEBER, EUGEN *Zur Aetiologie peripherer Ulnaris- und Medianuslahmungen* *Deutsche Ztschr f Nervenheilkunde*, XV, 181, 1899

MYCOSIS OF THE VERTEBRAL COLUMN

A REVIEW OF THE LITERATURE

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To the study of the clinical manifestations of actinomycosis, blastomycosis, and sporotrichosis must be definitely added the chapter concerning the involvement of the vertebrae by the causative agents of these specific infections. After a careful review of the literature, we have been able to gather the reports of sixty cases of mycotic spondylitis. From a study of these cases, we shall attempt to discuss the more salient anatomical, diagnostic, and prognostic features of the disease considered as a clinical unity.

Since it has become the subject of systematic research, the vertebral localization of mycosis is more and more frequently encountered in the literature. Since 1891, when Gimsberg and Bostroem in Germany reported three cases of vertebral actinomycosis, the number of such cases which have been published in the United States and abroad has multiplied. Parker, in 1923, reported two cases of his own, together with a summary of six other cases of that disease which had been published previous to that time. In 1927, in their interesting report of "Actinomycotic Pott's Disease", Simpson and McIntosh added four personal cases and for the first time submitted a comprehensive review of the anatomical findings in vertebral actinomycosis. Other case reports have been published and forty-seven cases of actinomycosis with vertebral involvement are available in medical literature.*

In 1903, Bassoe in the United States, adding to the numerous case reports of generalized blastomycosis, reported a case in which the vertebral localization of this disease assumed an importance not previously described. A number of authors have added to this list, principally in American periodicals, and twelve such cases** are to be found for study.

We are indebted to Allenbach and Zimmer† for the report of the only case of sporotrichosis of the vertebrae, which we have partially described in this article.

Upon examining the histories of these sixty cases of mycosis of the vertebrae, we have been struck by the similarity of the clinical course and the pathological findings in all three types of mycosis. It is for this reason that we have considered it of interest to review them as a whole.

* See bibliography on actinomycosis

** See bibliography on blastomycosis

† See bibliography on sporotrichosis

MORBID ANATOMY

The primary lesion is very rarely situated in the vertebrae. The spinal column is almost always invaded secondarily by the extension of a mycotic lesion located primarily in the buccal pharynx, the respiratory tract, the gastro-intestinal tract, and, exceptionally, in the skin.

Rarely, the primary infection is found at the back of the neck or in the facial region. These forms usually remain superficial, the suppurative process piercing its way directly toward the exterior, even in the event that migratory abscesses are formed, these very rarely attack the spinal column.

When the infection arises in the oesophagus, a peri-oesophageal phlegmon results upon the perforation of the wall of this organ, and the suppuration fuses its way to the loose areolar tissue of the posterior mediastinum along the bodies of the thoracic vertebrae (Bostroem, Ginsberg).

If the portal of entry is the larynx or trachea, the infection invades the lungs, reaches the mediastinum by way of the bronchial lymph nodes, and from there can attack the thoracic vertebrae or descend along the posterior slope of the diaphragm to the retroperitoneal areolar tissue, the retrorenal tissue, the psoas major muscle, and even to the pelvis (Wertheimann, Kolaczek).

An important seat of primary infection is offered by the caecum and vermiform appendix. Many periappendicular abscesses, showing no tendency toward spontaneous resorption, are found to be of mycotic origin, and only too often the diagnosis is made at autopsy. In one case, reported by Parker, a young man, operated upon for appendicitis, presented a suppurating postoperative scar which never completely healed. He died eight months after the operation and autopsy revealed, together with lesions of the lumbar vertebrae, a large abscess which completely encircled the lumbar spine and extended along the psoas muscle to the inguinal region. In a case similar to this one, described by Simpson and McIntosh, the first localization was also an appendicular abscess. The patient, a man forty-one years old, was seen six months after an appendectomy, because of a discharging sinus situated just above the right iliac crest. A stereoscopic x-ray examination, after the injection of barium into the sinus, showed the sinus to be in connection with the transverse process of the third lumbar vertebra. The patient died eleven days later and autopsy revealed multiple abscesses and sinus tracts, having the appendix as the primary focus and reaching backward toward the first three lumbar vertebrae and upward as far as the liver, the right psoas muscle was completely destroyed and replaced by a large abscess. The cancellous portion of the vertebrae showed considerable destruction of the bony trabeculae and was filled with pus and granulation tissue.

When the invasion of the vertebrae takes place by direct contiguity, the vertebral body is the first to be attacked by the destructive process. The bodies present a corroded appearance principally on their anterior surfaces which are stripped of periosteum and roughened. From the bodies, the infection proceeds laterally and posteriorly, attacking the

transverse processes, the neck and tubercle of the ribs, and finally the spinous processes (Seidenberg)

The erosion of the bone presents all of the intermediate steps,—from a slight superficial wearing to a complete rarefaction of the bony structure. In certain cases, the bodies show a very pronounced decalcification and can be easily cut with a knife (Bostroem). They contain a network of tiny cavities which pierce their way toward the exterior by means of narrow tortuous canals, giving a characteristic worm-eaten appearance to the vertebrae. In some cases, the cavities are larger and the bony tissue assumes a rough, spongy appearance, the spaces are filled with a yellowish liquid pus, containing, in certain cases of actinomycosis, the characteristic sulphur granules.

On the contrary, when the infection of the vertebrae takes place by vascular metastasis, as is most often the case in systemic blastomycosis, the exterior aspect of the vertebrae is found to be absolutely smooth. The destructive process is localized to the cancellous portion of the body where cavities are formed which are filled with yellowish, foul-smelling pus and granulation tissue. Very often this destroyed area is surrounded by a resistant capsule of condensed bony tissue. As a result of this protective process, the completely eroded bodies are prevented from flattening, as they do in tuberculous caries, and the comparative infrequency of the angular deformity, which is so typical of Pott's disease, is thus explained. Bostroem's patient, however, presented a marked kyphosis.

As a rule, there is no evidence of the existence of a concomitant inflammatory reaction on the part of the periosteum, nor does one see the formation of osteophytes which are so often found in most destructive processes of bone. Shiota reported the finding of osteophytic growths in one of his cases, but it seems quite possible that these preceded the mycotic infection.

The vertebral canal may be invaded by the pus which oozes through the bodies or seeps through the intervertebral spaces. Parker noted in one of his cases that the process of erosion had spread entirely through the vertebra and that a large mass of granulation tissue had formed between the anterior surface of the dura mater and the posterior aspects of the last three lumbar vertebrae. The granuloma, yellowish-gray in color, had completely compressed the dural sac and the elements of the cauda equina. In another case published by Parker, the pathologist reported the finding of a gelatinous mass of granulation tissue which had penetrated into the dura in the thoracic region and which had compressed the spinal cord from two sides.

Apart from the effects of mechanical pressure, the spinal cord is generally intact. In a few rare cases, a slight inflammatory reaction is noted (Parker, Simpson and McIntosh), but the destruction of a portion of the nervous tissue is an exceptional occurrence (Oswald).

The infection does not as a rule attack the intervertebral cartilages. In Bostroem's case, the erosion of the thoracic vertebrae left the intact

cartilages protruding on either side. They were united to one another by the remains of the vertebral ligaments which were stretched along the eroded vertebrae. However, in one of his cases, Parker noted a slight lesion of the peripheral portion of the cartilage, but the central portion appeared to be intact.

Microscopically, the vertebrae present zones of destruction by lacunar absorption with replacement by granulation tissue, composed of fibroblasts and round and epithelioid cells, and by degenerated tissue. This description suffices for both actinomycosis and blastomycosis, for, if in some cases of actinomycosis the characteristic sulphur granules are found, this is by no means always the case. In fact, one of us (M. M.) reported a case of blastomycosis of a tarsal bone in which similar yellow granules were seen. Simpson and McIntosh report the finding of many pale vacuolated, lipid-containing cells in the granulation tissue of vertebral actinomycosis. Practically, however, in the absence of sulphur granules, actinomycosis and blastomycosis of bone cannot be distinguished microscopically.

2

SYMPTOMATOLOGY AND DIAGNOSIS

It should be noted that the diagnosis of mycosis of the spine is a most difficult one to make. The mycotic nature of the infection is usually not recognized until the disease reaches a very advanced stage, and, in the great majority of cases seen, the true diagnosis was an autopsy finding. Of the sixty cases which we have studied, nine only were diagnosed clinically. Among the undiagnosed cases, Pott's disease was the usual clinical supposition.

As a rule, the infection of the spinal column remains unnoticed for a long period of time, obscured by the clinical manifestations of the primary lesion. The early symptoms may be very slight, often the patient complains of vague pain in the dorsal region which is eventually localized at a definite point along the spine. Sometimes slight pain is elicited on pressure. On the other hand, in some cases, especially those in which the cervical vertebrae are affected, very sharp pain is experienced from the onset, preventing the patient from making the slightest movement and leading to insomnia with nocturnal periods of excruciating pain. Stiffness of the neck and slight deafness marked the beginning of the clinical history in Schmidt's patient, in Martens' report, four months after the onset, stiffness of the neck appeared, with vague pain in the back, which led the author to think of Pott's disease.

Physical examination at the outset shows no pathognomonic sign. Much later, there may be noted a slight angular kyphosis (Bostroem), a painful contracture of the psoas with flexion of the thigh (Parker, Simpson and McIntosh), and, in the great majority of cases, a migratory abscess which follows the same route as one of tuberculous etiology and which, both by its form and position, resembles a typical tuberculous abscess. In this connection, Parker points out that psoitis with flexion of the thigh is too often considered to be a pathognomonic sign of Pott's disease. In

reality, not only mycosis but syphilis, neoplastic tumors, and retroperitoneal, perinephritic, periappendicular, and pelvic abscesses, regardless of their etiology, can all follow along the psoas and form purulent collections which can hardly be distinguished from a tuberculous abscess. It may be stated, however, as Simpson and McIntosh point out, that as a rule mycotic abscesses are more numerous, or a single abscess may have several ostia, neither of which conditions is seen in tuberculosis. The mycotic abscess differs also by the fact that it tends to fistulize very rapidly. The sinus burrows its way toward the surface, invading the muscles which it often completely destroys. The pus then infiltrates the subcutaneous tissues which become indurated, and the infiltration is followed by the appearance of reddish patches on the surface of the skin, forming the characteristic "placards" which sometimes give the alarm (Lefort). They gradually soften in their central portion, become fluctuant, and eventually break through the skin. According to the description of Simpson and McIntosh, "the boardlike, painless, or slightly painful induration, with multiple abscesses and sinus tracts, is a prominent characteristic." It is at this time that the parasites are most easily found, for later the inevitable secondary infection hides the characteristic bacteriological picture of the mycosis.

Several authors have found serious medullary symptoms, even to the extent of complete paraplegia, as in Parker's two cases. In the case reported by Chauffard and Troisier, the cervico-medullary actinomycosis had led to an attenuated spasmodic quadriplegia with ankle clonus and exaggerated tendon reflexes. In the great majority of cases, however, the only sign of medullary disturbance is a slight intercostal neuralgia.

The evolution is chronic in general and the disease can remain dormant with slight symptoms for as long as several years, but suddenly, without apparent cause, the malady assumes an acute aspect with fever, and leads rapidly to a fatal ending. The patient's general condition in the final stages of the disease—anorexia, extreme emaciation, asthenia, and continued fever—forms a characteristic picture. Death ensues by cachexia with amyloidosis of the viscera after a period varying from a few months to several years after the clinical onset.

The x-ray examination, absolutely negative at the outset, shows evidence of bone destruction only when the infection reaches a very advanced stage. In the rare cases of infection by the vascular route, one finds a zone of condensed bone surrounding a central area of decalcification. Seiler was able to show the existence of an intrasomatic cavity of the fourth lumbar vertebra by injecting lipiodol into the sinus. In the cases more frequently encountered, in which the vertebral column is infected secondarily by direct contact with a focus situated in the respiratory or digestive tracts, the infection is seen to penetrate the vertebrae from the surface toward the cancellous portion. The first sign perceptible in the roentgenogram is a diffuse shadow, giving the impression of an ossifluent abscess or a tumor (Parker). Yvin, to whom we owe a very interesting

case history, reports the finding of a dense paravertebral shadow along the thoracic vertebrae, in which the eighth, ninth, and tenth appeared to form a homogeneous mass. Yvin studied this patient carefully for a period of five years with repeated roentgenographic examinations and was able to show the gradual manner in which the spine was being attacked. During the fifth year of his observation, one roentgenogram showed a second focus in which the fourth and fifth thoracic vertebrae appeared involved and hazy. The patient died shortly afterward and, in contrast with the minimal x-ray findings, the post-mortem examination revealed the presence of a large cavity in the body of the fifth thoracic vertebra, which admitted the tip of the index finger, the eighth, ninth, and tenth thoracic vertebrae were glued together without appreciable deformity.

In Schmidt's case, the roentgenogram showed a veil stretching over the two pulmonary apices, the shadow dipping toward the right side, with nothing abnormal in the bones. The autopsy revealed the existence of a large prevertebral cavity, filled with granulation tissue and pus, and numerous abscesses of the cancellous portion of the second, third, fourth, and fifth thoracic vertebrae, as well as induration of the two apices.

The most characteristic x-ray sign, which definitely differentiates mycosis from tuberculous caries, is the erosion of the cortical portion of the vertebra, which is never seen in the latter condition. This erosion is clearly demonstrated in the roentgenogram by the presence of irregular contours, often saw-toothed, on the anterior surface of the vertebral body. Contrary to the signs in Pott's disease, it may also be pointed out that in mycosis the pedicles, the articular processes, and the transverse and spinous processes are subject to the same erosions as the body, whereas in tuberculosis these portions of the vertebrae remain untouched. In some cases of mycosis, the complete disappearance of the eroded transverse and spinous processes is reported.

In no case is to be found the uniform decalcification of one or more vertebrae, which is so often seen in Pott's disease. On the contrary, a very pronounced osseous condensation is observed, surrounding the destructive foci and giving them a mottled appearance in the roentgenograms. Some cases show a uniformly opaque image of the vertebrae, which is particularly noticeable in two roentgenograms which Allenbach and Zimmer have kindly put at our disposition.

The clinical histories of the two unpublished cases of Allenbach and Zimmer are summarized as follows:

CASE 1. R. H., a boy of twelve years, in April 1932, presented very acute symptoms with abdominal and lumbar pain, fever, and vomiting. On admission, six weeks after the onset, the child was pale, appeared to be in a bad general condition with a subfebrile temperature, and gave the clear impression of being afflicted with a generalized infection. Much pain was elicited on pressure on the third and fourth lumbar vertebrae. A fluctuant, painful swelling of the right paravertebral region was noticed. The iliac fossae were free. Routine examinations showed a prolonged sedimentation time, a negative von Pirquet reaction on three occasions, and a negative blood-Wassermann reaction.

The roentgenogram revealed a marked condensation of the third and fourth lumbar vertebrae which were also flattened by a third of their normal height and appeared to protrude on either side, they showed an absolutely metallic opacity. The anterior surfaces of the two vertebrae, as well as the inferior surface of the third lumbar vertebra and the superior surface of the fourth lumbar vertebra, were very irregular in outline.

Puncture of the paravertebral mass brought forth blood. The child was put to bed in a plaster cast.

In December 1932, an improvement in the general condition was noted, but the sedimentation time remained abnormally prolonged. The patient was discharged from the hospital.

In July 1933, after a renewal of the previous pain, an Albee bone-graft operation was performed. The postoperative events were normal and the patient was discharged in December 1933, wearing an orthopaedic corset.

In September 1934, the patient was again seen in consultation and presented a very bad general condition and a marked infiltration of the right iliac fossa. The abscess opened spontaneously three days later with the emission of a thick brownish-yellow pus which, on bacteriological examination, revealed actinomyces. The abscess closed and healed after four weeks. The patient was put under local and general iodide treatment but it was necessary to proceed cautiously, for he unfortunately presented a marked sensitiveness to iodine.

The patient left the hospital in December 1934, still under treatment, but in a very satisfactory general condition.

The second case of Allenbach and Zimmer, presumably one of vertebral sporotrichosis, is the only case of that nature which we have been able to discover, either in the literature or by correspondence.

CASE 2. E. A. During the evolution of an arthritis of the right shoulder joint the pus of which had shown sporotrichum on bacteriological examination, the patient complained from time to time of lumbar pain which, for many months, was considered to be due to "lumbago."

On admission to the hospital, the patient complained of vague lumbar pain which was slight and transitory. Slight pain was elicited on pressure on the spinous processes of the second and third lumbar vertebrae but there was no deformity.

The roentgenogram disclosed a decided density of the third lumbar vertebra. The body showed irregular contours and signs of periostitis.

The patient was put under iodide treatment and, at the present writing, is still under observation and treatment.

PROGNOSIS

Our study does not permit us to share Mouchet's optimism with regard to actinomycosis when he states that "the diagnosis of actinomycosis of the vertebral column is of considerable practical importance for, once recognized, the affection is easily cured." Of the sixty patients whose cases we have studied, two definitely recovered, three were still under treatment, and fifty-four succumbed to the effects of the disease, giving a mortality rate of 90 per cent. (Of the two definite recoveries, Brewer and Wood's patient responded to iodide treatment and was a case of vertebral blastomycosis, Guleke's patient recovered after the curetting of the infected vertebrae, and the condition was due to actinomycotic infection.) However, we do not believe that the prognosis is as somber as these figures seem to show, for, of the sixty cases, nine only were

diagnosed during the life of the patient, fifty-one were autopsy findings. Besides, it is more than probable that the benign cases, like those of Brewer and Wood and Guleke, are not recognized in current practice, and that the great majority of these cases completely escape the attention of the physician.

SUMMARY AND CONCLUSIONS

1 The reports of forty-seven cases of actinomycosis, twelve cases of blastomycosis, and one case of sporotrichosis of the vertebral column have been reviewed.

2 The examination of the anatomical and clinical aspects of these cases does not permit them to be visualized in separate groups, and the authors have considered and discussed these sixty cases of mycosis of the vertebral column as a clinical entity.

3 The infection of the vertebrae is most often found to be secondary, with a primary focus of infection situated principally in the respiratory and digestive tracts. The vertebrae are infected either by direct contact with a suppurating focus, in which case the external surfaces of the vertebrae are eroded, or by vascular metastasis, where the bone destruction is found to be central and surrounded by a condensed ring of bone. The first possibility appears to be most frequently the case in actinomycosis, the second, in blastomycosis.

4 The differential diagnosis of mycosis of the vertebrae and Pott's disease, for which the former is usually mistaken, is to be made chiefly on the following grounds:

a The angular deformity is most often absent in mycosis.

b Mycosis shows multiple sinuses, more destructive invasion, and a more rapid opening of abscesses than in Pott's disease, the skin lesions in mycosis are characteristic.

c X-ray examination shows erosion of the cortical portion of the vertebra, erosion which is present on the articular processes and pedicles as well as on the vertebral body, or cavity formation in the cancellous portion, surrounded by a zone of increased density. None of these signs are ordinarily seen in tuberculous spondylitis. The bony rarefaction of the latter disease sometimes gives place to a dense appearance in mycosis.

5 One of the factors in the high mortality rate of mycosis of the vertebral column appears to be the difficulty in making an early clinical diagnosis.

BIBLIOGRAPHY

ACTINOMYCOSIS

ABBOTT, D. P. Primary Actinomycosis of the Kidney. *J. Am. Med. Assn.*, LXXII, 1414, 1924.

ALLENBACH AND ZIMMER. Personal communication.

BASSOE, PETER. Discussion. *J. Am. Med. Assn.*, LXXXI, 659, 1923.

BEVAN, A. D. Actinomycosis. *Ann. Surg.*, XLI, 641, 1905.

BEVAN, A. D., AND POST, W. E. Actinomycosis. *Chicago Med. Recorder*, XXVII, 695, 1905.

- BOSTROEM Untersuchungen über die Aktinomykose des Menschen Beitr z path Anat u z allg Pathol, IX, 1, 1890
- BOUCHARD Personal communication
- BRICKNER, W M Pelvic Actinomycosis A Study of Five Consecutive Cases Successfully Treated by Operation Ann Surg, LXXXI, 343, 1925
- BULLITT, J B Report of a Case of Actinomycosis Hominis of the Lungs Ann Surg, XXXI, 600, 1900
- CARAVEN Ostéites et ostéo-arthrites mycosiques Thèse de Paris, No 165 Paris, G Steinhil, 1910
- CHAUFFARD, A., ET TROISIER, JEAN Actinomycose cervico-rachidien Évolution clinique et biologique Guérison. Rev de Méd., XXIX, 753, 1909
- COPE, V Z A Clinical Study of Actinomycosis, with Illustrative Cases British J Surg, III, 55, 1915
- GARTEN, J Ueber einen beim Menschen chronische Eiterung erregenden pleomorphen Mikroben Deutsche Ztschr f Chir, XLI, 257, 1895
- GINSBERG, SIEGMUND Casuistische Beiträge zur Kenntnis der Actinomycose des Menschen Berlin, G Chasté, 1890
- GODLEE, R J A Series of Cases of Actinomycosis Lancet, I, 3, 1901
- GULEKE Zwei seltenere Wirbelerkrankungen (Echinococcus und Aktinomykose) Deutsche Ztschr f Chir, CLXII, 59, 1921
- HEUCK, H. Ein Fall von Aktinomykose der Wirbelsäule und Brustwandungen mit Propagation auf die Lunge Münchener med Wchnschr, XXXIX, 419, 1892
- KOLACZEK, HANS Ueber aktinomykotische metastasierende Allgemeininfektion Beitr z klin. Chir, XCIII, 136, 1914.
- LEFORT Personal communication
- LEWIS, DEAN Referred to by C A. Parker (J Bone and Joint Surg, V, 759, Oct 1923)
- MACAIGNE ET RAINGEARD Actinomycose thoracique, cutanée, vertébrale, pulmonaire. Étude anatomique Presse Méd, VI, 331, 1898
- MCJUNKIN, F A A Case of Infection with Actinomyces Bovis Physician and Surgeon, XXIX, 213, 1907
- MALLORY, F B Referred to by J H Wright (J Med Research, VIII, 349, 1905)
- MARTENS Zur Kenntniss der Lungen- und Wirbelsäulenaktinomykose Arch f klin Chir, LXVI, 698, 1902
- MEYER, K. A Referred to by A H Sanford and Minna Voelker (Arch Surg, XI, 809, 1925)
- MEYER-BOBSTEL, H Über Knochenaktinomykose, insbesondere Kiefer- und Darmbeinaktinomykose Deutsche Ztschr f Chir, CCXVI, 233, 1929
- MOUCHET, ALBERT Maladies du rachis et de la moelle In Nouveau Traité de Chirurgie, by A Le Dentu and Pierre Delbet, XIV, p 520 Paris, J-B Baillière et Fils, 1913
- MÜNCH, A Actinomycosis hominis II Corr-Blatt f Schweizer Aerzte, XVIII, 234, 1888
- PARKER, C A. Actinomycosis and Blastomycosis of the Spine J Bone and Joint Surg, V, 759, Oct 1923
- PATTERSON, D W, AND NATTRASS, F J Actinomycosis of the Pleura An Account of Two Cases, with Pathological Findings British Med J, I, 918, 1925
- RUSSELL, P F Two Cases of Human Actinomycosis Proc New York Path Soc, XXI, 143, 1921
- SANFORD, A. H Distribution of Actinomycosis in the United States J Am Med Assn, LXXXI, 655, 1923
- SANFORD, A. H., AND VOELKER, MINNA Actinomycosis in the United States Arch. Surg, XI, 809, 1925
- SCHMIDT, KARL Aktinomykose der Wirbelsäule Rostock, Adler s Erben, 1926
- SCUDDER, C L Referred to by J H Wright (J Med Research, VIII, 349, 1905)
- SEIDENBERG, S M Zur Lehre der Meningitis purulenta actinomycotica Inaugural-Dissertation Basel, National-Zeitung A -G, 1919

- SHIOTA, H Beitrag zur Kenntnis der menschlichen aktinomykose *Deutsche Ztschr f Chir*, CI, 289, 1909
- SILHOL, JACQUES Un cas de streptothricose simulant la tuberculose *Bull de l'Acad de Méd*, LXXXVI, 18, 1921
- SIMPSON, W M, AND MCINTOSH, C A Actinomycosis of the Vertebrae (Actinomycotic Pott's Disease) *Arch Surg*, XIV, 1166, 1927
- SNOKE, P O Actinomycosis A Report of Five Cases—with Four Autopsies—Two Showing Involvement of the Central Nervous System *Am J Med Sciences*, CLXXV, 69, 1928
- WERTHEMANN, A Über die Generalisation der Aktinomykose *Virchows Arch f path Anat*, CCLV, 719, 1925
- WRIGHT, J H The Biology of the Microorganism of Actinomycosis *J Med Research*, VIII, 349, 1905
- YOUNG, J K Actinomycosis of the Ribs and Vertebrae *Am J Orthop Surg*, VI, 252, Nov 1908

BLASTOMYCOSIS

- BASSOE, PETER Disseminated Blastomycosis Report of a Case Involving the Lungs, Lumbar Vertebrae, and Subcutaneous Tissues, with Multiple Abscesses and Fistulae, and Extensive Amyloid Degeneration *J Infect Diseases*, III, 91, 1906
- BOUGHTON, T H, AND CLARK, S N A Case of Blastomycosis *Arch Int Med*, XIII, 594, 1914

Referred to by C A Parker (*J Bone and Joint*

Surg, V, 759, Oct 1923)

- BREWER, G E, AND WOOD, F C Blastomycosis of the Spine Double Lesion Two Operations Recovery *Ann Surg*, XLVIII, 889, 1908
- EISENDRATH, D N, AND ORMSBY, O S A Case of Systemic Blastomycosis, with Blastomycetes in the Sputum *J Am Med Assn*, XIV, 1045, 1905
- EISENTAEDT, J S, AND BOUGHTON, T H A Case of Systemic Blastomycosis *Arch Int Med*, XIII, 617, 1914
- IRONS, E E, AND GRAHAM, E A Generalized Blastomycosis Report of a Case with Miliary and Ulcerative Blastomycosis of the Lungs, Miliary Blastomycosis of the Spleen, and Multiple Superficial and Deep Abscesses *J Infect Diseases*, III, 666, 1906

(Abstracted in *Trans Chicago Path Assn*, VI, 444, 1903-1906)

- KROST, R A, MOES, M J, AND STOBBER, A M A Case of Systemic Blastomycosis *J Am Med Assn*, L, 184, 1908
- MEYER, MARCEL, SARTORI, A -R, ET MEYER, J Blastomycose osseuse simulant l'aspect "d'une scaphoïdite talsienne des jeunes enfants" *Presse Méd*, XLIII, 558, 1935
- MONTGOMERY, F H, AND ORMSBY, O S Systemic Blastomycosis Its Etiologic, Pathologic and Clinical Features as Established by a Critical Survey and Summary of Twenty-Two Cases, Seven Previously Unpublished, The Relation of Blastomycosis to Coccidioidal Granuloma *Arch Int Med*, II, 1, 1908
- OSWALD Referred to by F H Montgomery and O S Ormsby (*Arch Int Med*, II, 1, 1908)
- PARKER, C A Actinomycosis and Blastomycosis of the Spine *J Bone and Joint Surg*, V, 759, Oct 1923
- SEITZ, SANDRO Beitrag zur Klinik der Blastomykosen *Brunns Beitr z klin Chir*, CLVI, 609, 1932
- STOBFF, A M Systemic Blastomycosis A Report of Its Pathological, Bacteriologic and Clinical Features *Arch Int Med*, XIII, 509, 1914
(See also *Arch Int Med*, XIII, 557, 568, 585, 599, 1914)
- YAN, M Un cas de mycose vertébrale *Rev d'Orthop*, XXI, 42, 1934

SPOROTRICHOSIS

- ALLENBACH AND ZIMMER Personal communication

REGROWTH OF BONE AT THE PROXIMAL END OF THE RADIUS FOLLOWING RESECTION IN THIS REGION

BY CHARLES J. SUTRO,* M.D., NEW YORK, N. Y.

From the Laboratory Division, Hospital for Joint Diseases

Regrowth of bone, through regeneration of the proximal portion of the radius, occasionally complicates conditions in the elbow joint following the resection at the head or neck of the radius, undertaken for fracture or dislocation.^{1, 2, 3, 4, 5} Such new bone may interfere with motion of the elbow joint, including that of the upper radio-ulnar articulation. The aim of this study is to present in detail the anatomical findings in several such cases. By discussing the mechanism underlying the conditions in these cases, it is hoped that such complications may be prevented. Four cases† are described to illustrate the points under discussion.

CASE REPORTS

CASE 1 (No. 44002), a boy, eight and one-half years old, injured his right elbow in June 1928. Soon after the injury, he came to the Hospital for the correction of an outward dislocation of the head of the right radius. A resection of the head and part of the neck was done. The bone which was removed is shown in Figure 1.

Five years later (1933) the patient was readmitted because of limitation of extension of the right elbow and limitation of supination of the forearm. Roentgenographic examination at the time of his second admission showed that, in place of the resected original head and part of the neck, new bone had appeared (Fig. 2). In fact, the right radius at this time was actually longer than the left radius. This is apparent even in the roentgenogram with the elbow at an angle of 100 degrees.

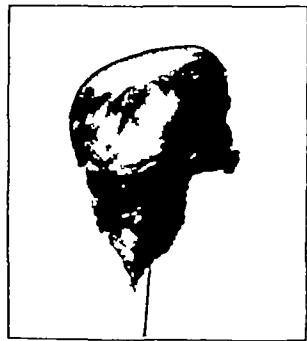


FIG. 1

Case 1. Resected dislocated original head of the radius and part of the neck.

A second resection was performed and about two inches of the upper end of the radius was removed (Fig. 3). There was immediate improvement in the function of the right elbow and in the ability to supinate and pronate the forearm.

The resected fragment was rather a deformed piece of bone. It measured in length two and one-half times the diameter of the fragment at the site of resection. Its upper end was somewhat flattened. Much of the specimen was covered by fibrous tissue.

The microscopic examination showed that the distal two-thirds of the resected fragment was comprised of adult lamellar cortical bone which enveloped a medullary canal. The upper end of the fragment (proximal third) was capped by a fairly dense fibrous and fibrocartilaginous connective tissue. This sheath of connective tissue corresponded to the hyaline articular cartilage which would be present normally at the upper

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† From the Services of Dr. Finkelstein and Dr. Frauenthal.



FIG 2

Case 1 Right elbow five years after resection of the dislocated head of the radius. Note the deformed "new head of the radius", as well as the increase in length of the shaft.

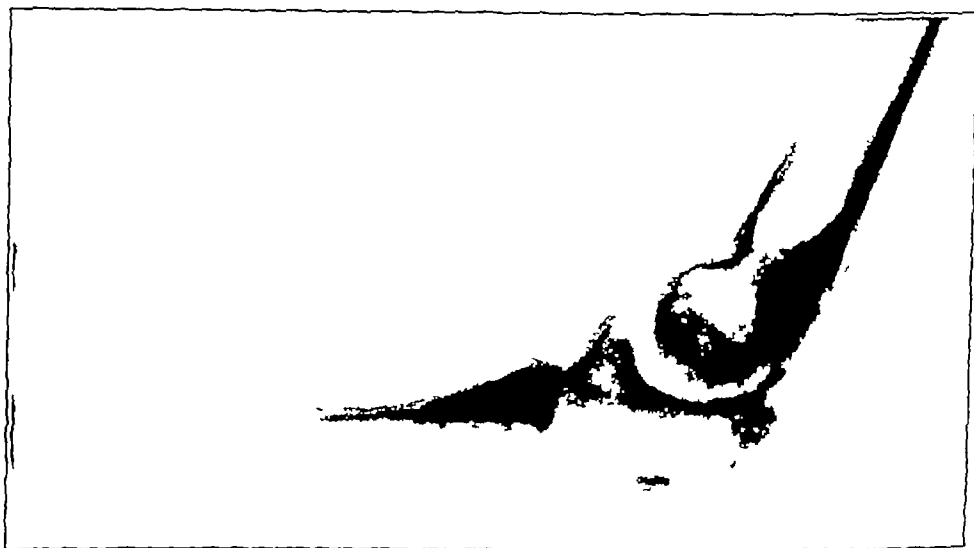


FIG 3

Case 1 Right elbow after resection of the "new head"

end of the radius. Beneath this covering, there were exceedingly thick newly formed spongy trabeculae. Their intertrabecular marrow was of a cellular fatty character (Fig 4). It was evident from the examination that conditions at the tip of the resected fragment had by no means reached a *status quo*. Active new-bone formation with active reconstruction was in evidence, particularly beneath the connective tissue (Fig 5).

Here and there, a few additional fragments of connective tissue were observed. These were possibly fragments of capsule or fragments of adhesive bands between the

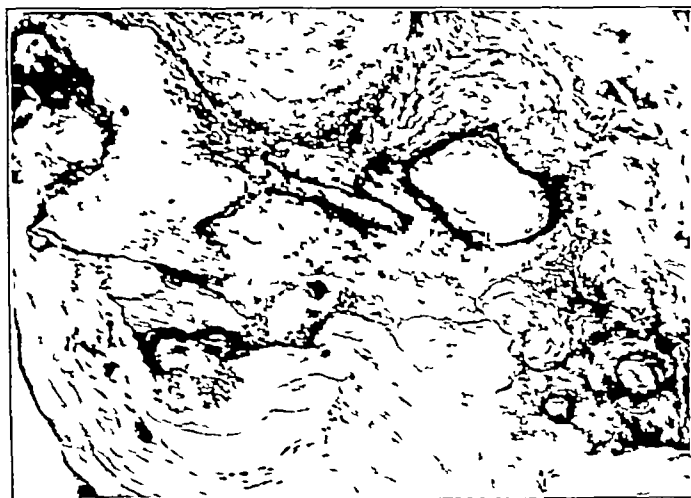


FIG 6

CASE 1 High-power photomicrograph (X 160) of area R in Fig. 4, showing calcification and ossification in a fragment of capsular tissue



FIG 5

CASE 1 High-power photomicrograph (X 125) of area Q in Fig. 1. The trabeculae have increased in length and width by calcification and ossification of the contiguous fibrous tissues, as well as by osteoblastic activity. Note the fibrous and fibrocartilaginous cup which was the site normally of the articular hyaline cartilage



FIG 4

CASE 1 Photomicrograph (X 15) of the "new radial head", which consists of numerous closely set bone trabeculae, capped by dense fibrous and fibrocartilaginous tissue (Q). Note an area of bony metaplasia in a fragment of capsule (R)

regenerated upper end of the radius and its surrounding tissues. Within these connective-tissue fragments, calcification, ossification and new-bone formation were also apparent (Fig 6).

It appeared, therefore, from the roentgenographic and pathological findings that, after resection of the original head and part of the neck, reformation of bone had occurred. The regenerated bone was reconstructed in its distal two-thirds, so that a new compact cortex was formed. In its proximal third, the specimen showed active new-bone formation with growth still in progress. The new ossification was through the mediacy of connective tissue which first became calcified and then ossified. Osteoblasts and osteoclasts were seen in this portion of the newly reformed head and neck.

CASE 2 (No 49426), a boy, fourteen years old, sustained an injury to his left elbow in August 1932. This caused a fracture in the region of the head of the radius. Initial treatment was given at another hospital where the injured region was first manipulated, and three weeks later an open removal of the head of the radius was done. In spite of the open operation, restrictions to movements of the elbow soon developed.

The patient was admitted to the Hospital for Joint Diseases in April 1933, primarily because of limitation of extension of the elbow to an angle of 115 degrees. In addition, pronation of the supinated forearm was restricted to 5 degrees of motion. A roentgenogram at this time demonstrated new bone at the site of the resected head (Fig 7). Another operation was performed to remove the new bone which restricted the motion at the elbow joint (Fig 8). The removal of the newly reformed head and part of the neck restored completely the range of pronation and supination of the forearm. Extension of the elbow was still slightly limited.

On gross examination, the specimen showed its proximal third to be somewhat expanded (Fig 9). In appearance it simulated a head of the radius. The proximal end of the removed "new head" was covered partly by fibrous tissue. In the areas not covered by fibrous tissue, cancellous bone was noted. Section through the long axis of the specimen showed its cortex to be lamellated on one side and markedly thinned on the other.

On microscopic examination, the proximal end of the specimen was partly covered by fibrous tissue (Fig 10). Thus, in spite of a recurrence of a "headlike" bony mass, no articular cartilage was to be found. Beneath this layer of fibrous covering, partly dead trabeculae, thickened by new-bone deposits, were to be found. The intertrabecular marrow immediately beneath the fibrous tissue which covered the end of the specimen was of a cellular and fibrous character. Metaplasia of this fibrous tissue into bone

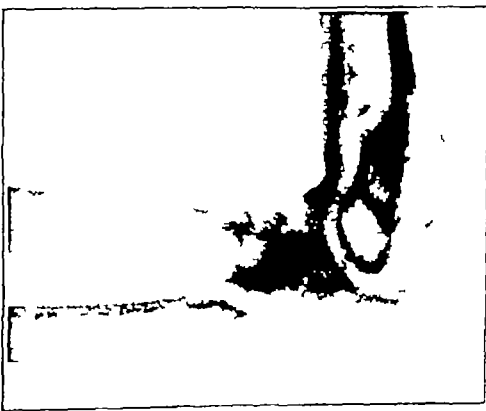


FIG 7

CASE 2. Left elbow, showing regrowth of bone at the site of the resected original head of the radius.



FIG 8

CASE 2. Left elbow after resection of the 'new head of the radius'. Note calcification in the anterior capsule of the joint.

was to be seen. Here, also, the increase in the length of the radius, after resection of the original head of the radius, was apparently due to the bone-forming capacity of the connective tissue in the medullary spaces (Fig 11). The distal two-thirds of the bony specimen revealed trabeculation of one of the cortices with considerable new periosteal bone.

This patient was admitted again in July 1934 because of recurrence of symptoms referable to the left elbow. The roentgenogram showed osseous union between the "second newly formed head of the radius" and the ulna. In addition, pseudarthrosis was present between the "regenerated head" and the shaft of the radius (Fig 12). The reformed mass was removed surgically (Fig 13).

On gross examination, the specimen consisted of a quite irregular nodule of bone. Most of its surface was covered by tendinous tissue. On section, the bone was seen to be eburnated (Fig 14). On what was assumed to be its upper (proximal) surface, was a layer of fibrocartilage of approximately three millimeters in thickness. The other surface (distal) was also covered by a thin layer of fibrocartilage. The microscopic examination demonstrated that the resected bone fragment consisted of newly formed lamellar bone. Both ends were covered by fibrocartilage.

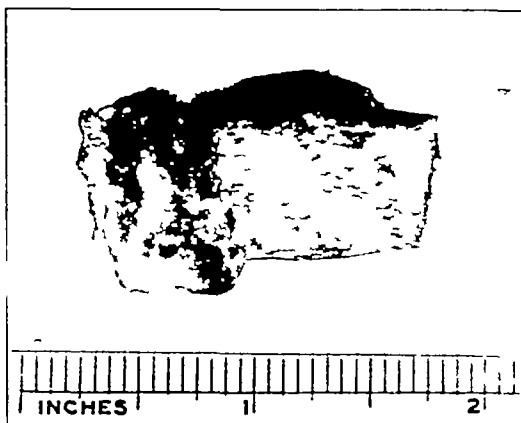


FIG 9

Case 2. Resected proximal portion of the radius. Note the expansion which simulates in appearance the head of the radius.

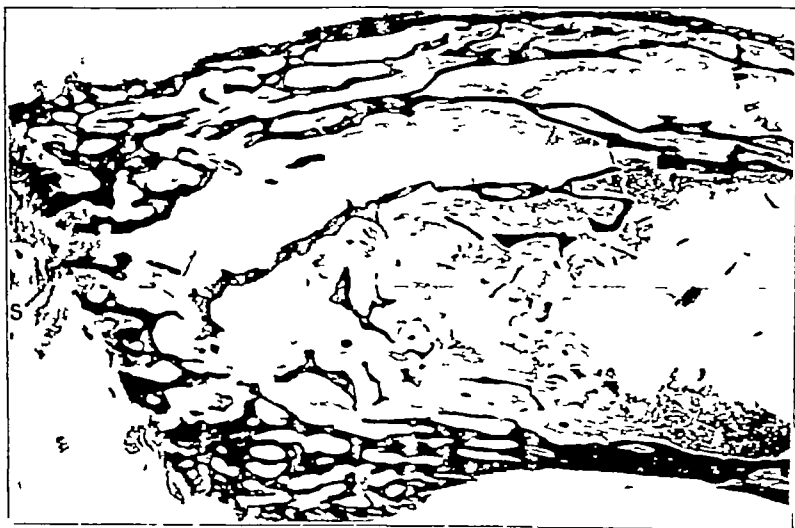


FIG 10

Case 2. Photomicrograph ($\times 4$) of a longitudinal section through the specimen (Fig 9), disclosing that the expansion seen on gross examination is the result of numerous newly formed bone trabeculae. The 'new radial head' is partly covered by fibrous tissue (S). Note that the cortex of the shaft (upper) is lamellated with considerable new periosteal bone. The opposite cortex is thin.



FIG 11

Case 2 High-power photomicrograph ($\times 160$) of area *S* in Fig 10, showing a lamellar trabecula, containing several anuclear lacunae. Note the apposition of the fibrous bone. Osteoblastic and osteoclastic activity is prominent.

CASE 3 (No. 41258), a boy, fourteen years of age, injured his left elbow eight years before admission. A fracture of the head of the left radius was sustained. Treatment at another hospital consisted of resection of the proximal portion of the left radius (Fig 15). Since then, limitation of flexion of that elbow had developed.

On admission to the Hospital for Joint Diseases, eight years after the injury, treatment to improve the range of flexion in the left elbow joint was sought. The roentgenogram taken at this time showed reformation of bone at the proximal end of the radius (Fig 16). Apparently, the new bone blocked flexion of the elbow. Restoration of flexion was obtained by removal of one inch of the proximal end of the radius and of a spur on its anterolateral surface.

Several fragments of tissue were received at the laboratory for macroscopic and microscopic study. One fragment (*a*), measuring about two centimeters in diameter, resembled somewhat the head of the radius in appearance. This piece of bone was covered by fibrous adhesions and by a mass of hyaline cartilage, containing part of the capital epiphysis. Another piece of tissue (*b*), apparently the anterior spur seen in the roentgenogram, was composed of a piece of bone with an attached nucleus of cartilage (remnant of the radial capital epiphysis).

The microscopic examination of fragment *b* revealed a triangular piece of bone to which was attached some hyaline articular cartilage (Fig 17). This segment of bone consisted of numerous trabeculae covered with a thick cortex. A remnant of the original cortex of the radius was discernible as a large trabecula in the medullary canal of the spur (Fig 18). From the appearance of the cement lines in this trabecula, one gathers that there had been resorption. The cartilage mentioned in the gross examination was an area of hyaline articular cartilage, containing a focus which was undergoing endochondral ossification. The microscopic examination of fragment *a* revealed nothing unusual.



FIG 12

Case 2 Left elbow (fifteen months later than Fig 8), showing the regrowth of a "second newly formed head of the radius" There is bony union between it and the ulna, pseudarthrosis exists between the "new radial head" and its shaft

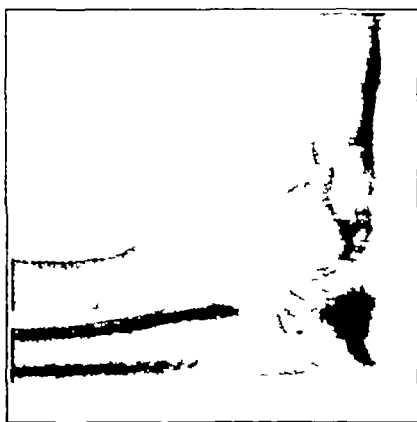


FIG 13

Case 2 Left elbow after the resection of the "second newly formed head"

except the presence of a thick layer of fibrous tissue which probably joined fragment *b*

It appears that the partially newly reformed head consisted of trabeculae, probably derived from periosteum of the original cortex of the proximal portion of the radius

CASE 4 (No 41463), a woman, forty-six years old, injured her right elbow five years before admission Soon after the injury, a diagnosis of fracture of the neck of the right radius, with dislocation of its head, had been made Three days later, the head and part of the neck of the radius had been removed Subsequent to the operation, the patient had complained of limitation in the ability to pronate or supinate her right forearm Three months after the operation, another surgical intervention had been proposed which, however, had been refused

Five years after the injury, the patient sought treatment to increase the range of motion in her right elbow and forearm The right forearm was fixed in a position midway between pronation and supination, and the limitation of motion had persisted for five years

A roentgenogram at this time revealed a bony overgrowth at the site of the original resection In addition, a small bony overgrowth was present over the olecranon fossa (Fig 19) Surgical treatment consisted in the resection of the upper one and one-half inches of the radius (Fig 20)

On macroscopic examination, the specimen was found to be a piece of



FIG 14

Case 2 Sectioned "second newly formed head of the radius" The spongy bone is covered on its upper (proximal) and lower (distal) surfaces by fibrocartilage

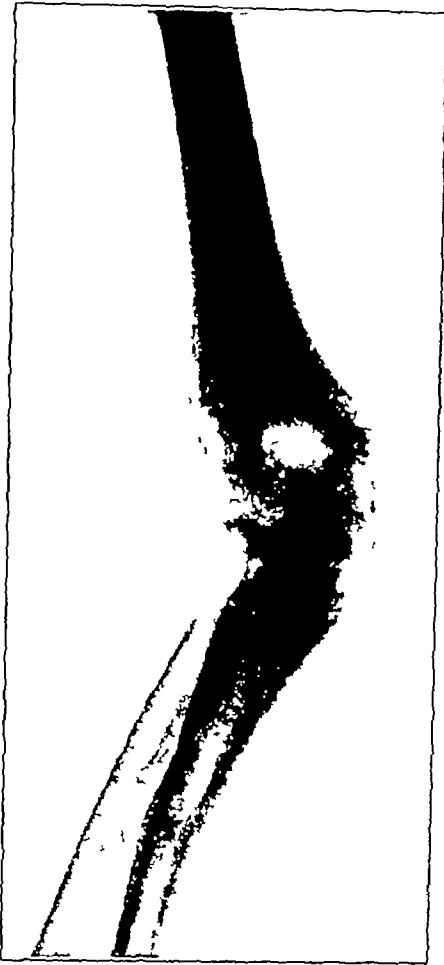


FIG 15

Case 3 Left elbow, two years after the resection of the proximal portion of the radius, showing slight periostitis of the proximal end of the radius



FIG 16

Case 3 Left elbow, eight years after resection of the proximal portion of the radius, showing pronounced periostitis of the proximal end of the radius (spur formation) with an attempt at the formation of a "new radial head"

bone which came from the proximal end of the shaft of a long tubular bone. Microscopic examination showed that the "reformed head" of the radius (spur as seen in the roentgenogram) was composed of numerous thin, atrophic, and partly necrotic bone trabeculae (Fig 21). Previously, there had been apparently a period of active new-bone proliferation, as evidenced by living new bone about a piece of fibrous tissue in the medullary cavity. Portions of the original thick cortex (posterior) show some evidence of necrosis (Fig 22).

DISCUSSION

Surgical resection of a fractured or dislocated proximal portion of the radius may be complicated by the regeneration of a "new head of the radius", as noted in the cases reported. This eventuates most likely from the accumulation and organization of blood in the space left by the surgical resection of the head of the radius, with or without excision of the neck. It is well known that the marrow spaces of the long tubular bones contain tissue with osteogenic potentialities. This tissue appar-

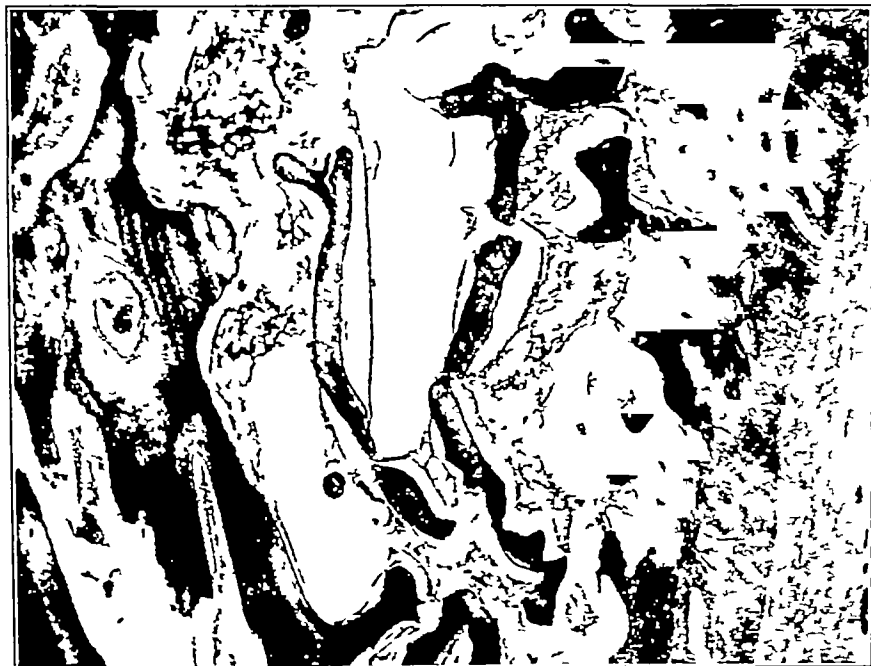


FIG. 18

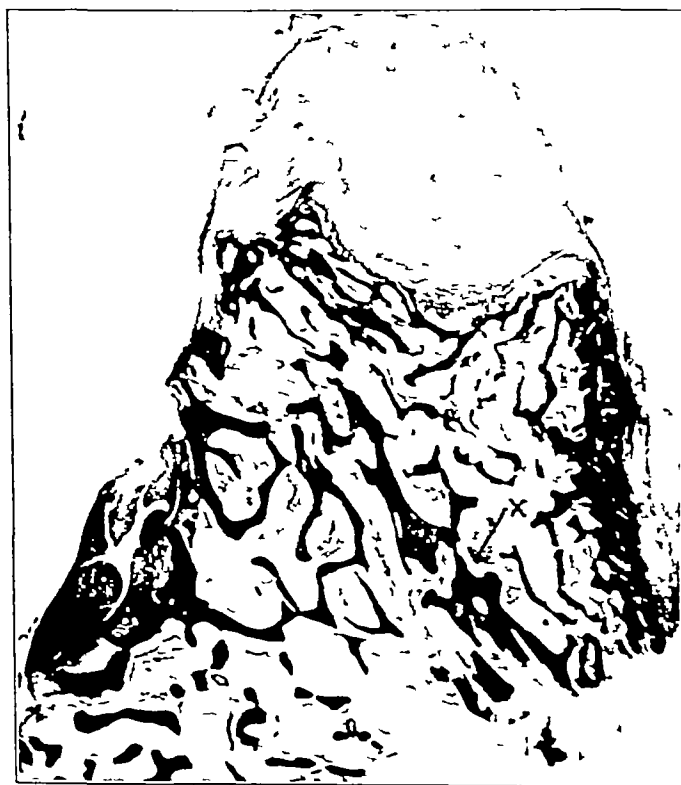


FIG. 17

Case 3. Photomicrograph ($\times 5$) of fragment *b* which consists of numerous bone trabeculae, covered on one surface by a thick cortex and on another by a piece of articular hyaline cartilage. A trabecula (*A*), probably a remnant of the original cortex of the radius, is noted in the medullary canal.

FIG. 18

Case 3. High power photomicrograph ($\times 30$) of area *A* in Fig. 17, showing a thick lamellar trabecula, containing numerous parallel cement lines. The irregular outline of this trabecula and the interruption of its cement lines are evidence of resorption.

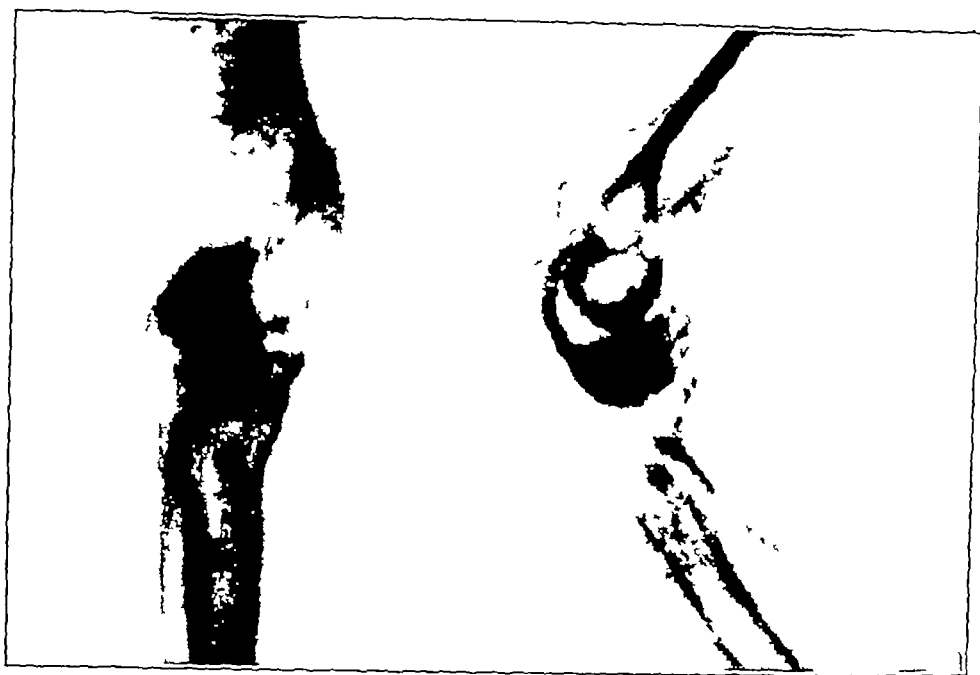


FIG 19

Case 4 Right elbow, five years after surgical removal of the proximal portion of the radius, showing regrowth of bone at the site of resection

ently makes its way into the adjoining organized hemorrhage. Furthermore, the periosteum of the radius adjacent to the resected area, as well as the tissue of the joint capsule, apparently participates in the formation

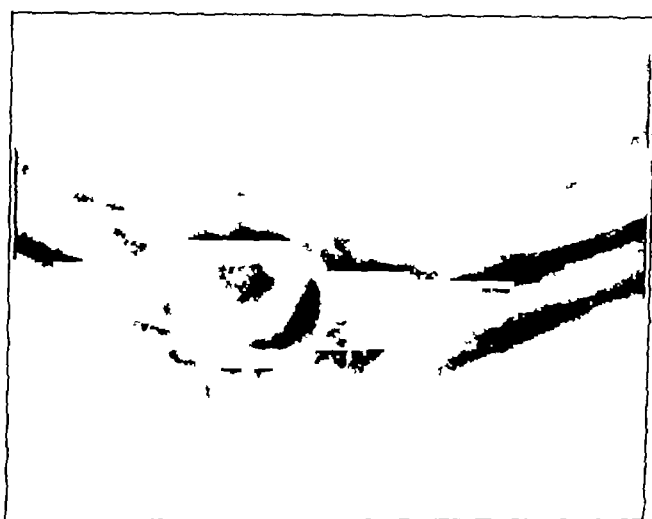


FIG 20

Case 4 Right elbow after resection of the "new radial head"

of this bone. Most of the newly formed trabeculae, which result in an increase in the length and width of the proximal end of the radius, are formed by osteoblastic activity, as well as by metaplasia of the contiguous fibrous tissues. Some of the recently formed fibrous bone is soon transformed into adult bone. The "new head of the radius" may present a cortex and a medullary canal. However, it lacks hyaline articular cartilage. The proximal surface of the "new radial head" may be capped either by fibrocartilage or by fibrous tissue. This is most likely derived from the capsular tissue about the joint. It is interesting that the formation of bone at the site of the resection of the original

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FIG 22

CASE 4 High-power photomicrograph ($\times 100$) of the posterior cortex (Y) in Fig 21, showing several areas with empty lacunae

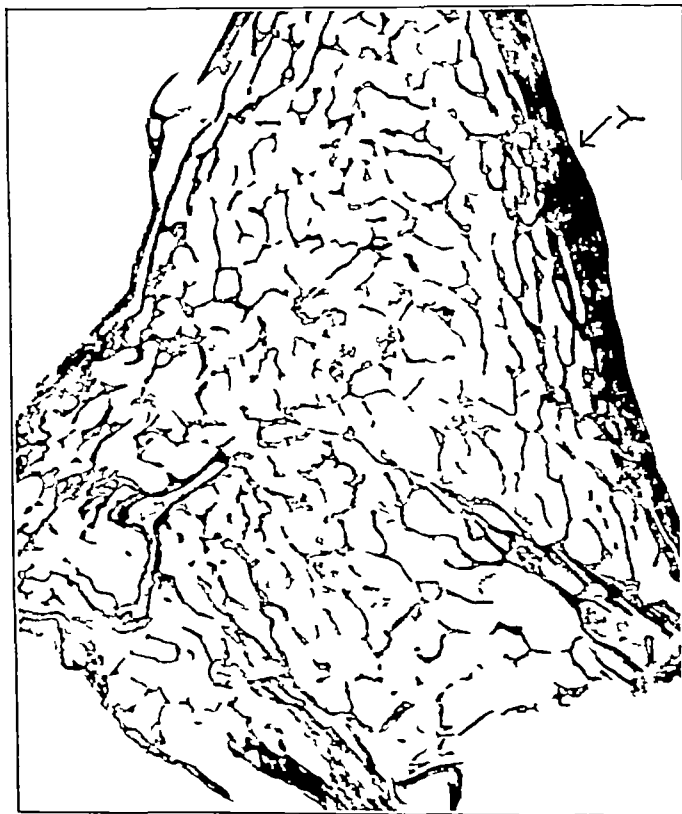


FIG 21

CASE 1 Photomicrograph ($\times 4$) of a section of the "reformed head of the radius", showing numerous thin and partly necrotic bone trabeculae. Note the bony proliferation about a piece of fibrous tissue in the upper part of the medullary canal. The posterior cortex (A) is partly necrotic

head of the radius may lead to an unusual lengthening of the shaft of the radius when compared with the normal opposite radius. This condition may be noted when the "new head of the radius", by virtue of its abnormal location (lateral or inferior to the lateral condyle of the humerus), avoids the opposing force of the lower end of the humerus (Case 1).

It would seem, therefore, that, in cases where surgical removal of the proximal portion of the radius is necessary, a reconstruction operation, using fascia lata to prevent abnormal growth of the stump, should be attempted.^{6, 7, 8, 9} The periosteum on the proximal (free) end of the shaft of the radius should be stripped back, all bone fragments, periosteal strips, or capsular tissue, either lying free in the joint or loosely attached to contiguous tissues, should be removed. In addition, if an unusually large segment of the proximal portion of the original radius is resected, the gap should be filled by a bone graft.

The author is indebted to Dr. H. L. Jaffe for helpful criticism and to Dr. M. S. Burman for his assistance.

REFERENCES

- 1 SPEED, KELLOGG Traumatic Lesions of the Head of the Radius. Relation to Elbow-Joint Dysfunction. *Surg Clin North America*, IV, 651, 1924.
- 2 MADLENER, M. J., UND WIENERT, B. Beitrag zu den Brüchen des proximalen Radiusendes unter Berücksichtigung der Spätresultate. *Arch f klin Chir*, CLXIII, 591, 1931.
- 3 KEY, J. A. Treatment of Fractures of the Head and Neck of the Radius. *J Am Med Assn*, XCVI, 101, 1931.
- 4 SCHWARTZ, R. P., AND YOUNG, FORREST. Treatment of Fractures of the Head and Neck of the Radius and Slipped Radial Epiphysis in Children. *Surg Gynec Obstet*, LVII, 528, 1933.
- 5 BOHRER, J. V. Fractures of the Head and Neck of the Radius. *Ann Surg*, XCVII, 204, 1933.
- 6 SPEED, KELLOGG. Fracture of the Head of the Radius. *Am J Surg*, XXXVIII, 157, 1924.
- 7 BAUMANN, ERNST. Beiträge zur Kenntnis der Frakturen im Ellbogengelenk. II. Brüche am unteren Ende des Humerus (ausser Supracondylar) und Brüche am proximalen Ende des Radius. *Bruns' Beitr z klin Chir*, CXLVII, 369, 1929.
- 8 MATTEI, HERMANN. Die Knochenbrüche und ihre Behandlung. 2. Aufl. Berlin, Julius Springer, 1931.
- 9 PFAB, BRUNO. Über Radiusköpfchenverletzungen. *Arch f Orthop u Unfall-Chir*, XXXIV, 97, 1933.

SOME CONSIDERATIONS BASED ON 300 CASES OF ARTHRITIS CRITICALLY TREATED*

BY RALPH PEMBERTON, M D , PHILADELPHIA, PENNSYLVANIA

Arthritis invites more strong statements relating to etiology and therapy than does any other disease. The tempered conclusion is often overlooked or ignored because it does not raise its voice above the shouting of extremists. For these reasons, as well as for others, it becomes important to endeavor from time to time to ascertain what the conditioning factors of therapy should be and what the results of therapy really are, when a considerable series of arthritics is treated over many years under critically controlled circumstances. Advance in medicine is achieved through hypothesis and trial and at last analysis clinical therapeutics must afford the final criterion of success or failure. It should be clearly recognized at the outset that the conditions under which therapy (even the most rational therapy) is practised, as well as the point of view maintained towards it, may significantly alter end results for better or for worse.

The present series cannot hope to escape errors inherent in this situation, but certain deductions seem permissible and justifiable. The review is based upon 300 cases. This number is expected to be extended to 500 cases and the present comments are, therefore, to be understood to be in the nature of a progress report. No attempt will be made at this time toward a complete statistical analysis. The effort will be made to direct attention merely to certain significant features not likely to be importantly altered by the addition of more cases. This series was composed of patients with arthritis, seen in the dispensary, in the wards, in the office, and in private rooms, and was studied with the assistance of Dr T F Bach. The proportion of cases on which adequate care could be concentrated was large and it is probable that, with the exception of such therapy as is available in a small number of specialized hospitals, only private cases can be so handled in general as to permit of the greatest refinements in sustained treatment. A very significant proportion of these cases had been referred by other physicians after careful scrutiny elsewhere and often after long periods of therapy.

In the first place, the results of therapy have been gratifying, considering the group as a whole. About 57 per cent of the patients were definitely improved and 32 per cent were greatly improved, making 89 per cent altogether, 6 per cent were cured. The figures were almost exactly the same for both the atrophic and hypertrophic types of arthritis. This fact should not be overlooked. These figures will be analyzed later. The term "cure" has been limited deliberately to those cases in which a

*Read by invitation before the Annual Meeting of the American Orthopaedic Association, Philadelphia, Pennsylvania, June 6, 1935

close approach was made not only to the activities but also to the appearances of perfect health, thus the cases in which the patients presented great deformity, with its mechanical sequelae, have been excluded

When the previous therapy received by these arthritics is considered, certain long accepted factors stand out, which it seems important to review. Heading the list is the removal of focal infections, practised in about 66 per cent of the cases of atrophic arthritis and in 47 per cent of the cases of hypertrophic arthritis

In the course of a new and complete medical survey of the cases in this series, it became necessary to reexamine these patients for focal infection and such infection was discovered in an amazingly high percentage of cases,—namely, in 79 per cent of the cases of the atrophic type and in 81 per cent of the hypertrophic type. From the observations on these two groups, it is apparent that the removal of focal infection, as practised, did not alone control the disease, and, also, that focal infection had been inadequately removed in many cases, or that other focal infection developed subsequently to the previous examinations. It would certainly be unfair to say that all previous examinations for focal infection had been inadequate, or that all removals of focal infections had been without influence. The other implication inherent in these figures,—that focal infection arose as a result of the disease or of the conditions producing the disease—is in line with the writer's belief, and now receives some further statistical confirmation. Thus, in cases studied with Pelouze, it is definitely shown that an abscessed tooth, caused by any of several strains of streptococci, may induce or perpetuate a prostatitis in which the organism, curiously enough, may show many staphylococcic characteristics

As a further corollary, it is probably fair to state that, despite the intensity with which specialism in the field of the "surgery of infections" has been developed in this country, an analysis of any given case, even by well trained operators, does not necessarily achieve the results desired. The writer is thoroughly convinced that the analysis of the arthritic for focal infection constitutes almost a subdivision of the analysis of disease at large for focal infection, and he finds it necessary to depend upon the opinions of a small number whose experiences have grown up with his own in the fields under consideration. It seems probable that the failure in other hands of some lines of therapy, directed at certain patients for whom it has been deemed appropriate, has been referable in fact to unrecognized obstacles or drags

Therefore, the first broad generalization to be derived is that an arthritic clinic which aspires to function with justice to its patients, in terms of the best results attainable to-day, must attach to itself consultants trained not only in the special diagnosis and treatment of surgical infection, but also with additional training in determining the relation of such infection to chronic arthritis

Another factor attendant on the high incidence of focal infection in

the 300 cases here considered is the previous use of vaccines. About 20 per cent of the patients with atrophic arthritis and 13 per cent of those with hypertrophic arthritis had received this form of therapy. Again, to negative all advantages from this procedure in these instances would be dangerous, and it can only be said that vaccine therapy did not stem the tide of the disease in the cases so treated. The cases in the present series which were deemed by the writer to be appropriate for vaccines fell within the group of refractory cases (10 to 15 per cent) to be mentioned later. The bulk of the cases responded well without such therapy.

A feature of therapy, conspicuous by its absence in the early histories of these cases, is systemic rest. The writer and his associates have come to believe that systemic rest is important or necessary in the treatment of practically all arthritides except possibly early in the disease and in robust individuals.

A review of the cases now under consideration reveals that appreciation of this approach to therapy has had very narrow extension to the profession at large. The writer believes that rest is something more specific than the term usually connotes and that it would be preferable, if possible, to prescribe, instead of rest, treatment which would result in the specific influences which rest creates. It is thus perhaps desirable to refer briefly at this point to the early alterations to be achieved,—especially in the capillary beds, in the circulatory dynamics at large, in the direction of interchange of the fluid tissues of the body, in the gravitational pull upon practically all structures, and especially upon the gastro-intestinal tract. Again, there is growing appreciation that imbalance of the nervous system contributes to arthritis, but therapeutic application of this relationship is avowedly inadequate. Sedation is not infrequently desirable.

In the present series, rest in a systemic sense was utilized as widely as, or probably more widely than, has been the case in any other comparable number of subjects. In retrospect, there can be no doubt of the extraordinary betterment which it alone achieves. The dramatic improvement sometimes seen within a few days in the sick arthritic confined wholly to bed may be nothing short of amazing and may render him unsuitable for contrast laboratory studies. Whatever the primary causes of the disturbances of physiological function which characterize arthritis, it is clear that these dislocations are usually susceptible of marked and even early return toward normal. The infrequency with which anodynes or salicylates were used in the present series amply testifies to this fact. It is not to be implied, however, that in the opinion of the writer the institution of rest constitutes the end of therapy. It does, however, in his opinion constitute the basis upon which nearly all other therapy should be instituted. A definite corollary arising out of experiences in this direction is, therefore, that adequate therapy for arthritides demands hospitalization and subsequent opportunities of a comparable nature in order to maintain the advantages gained.

A field which had received scant attention in the series as a whole was the gastro-intestinal tract. Analysis revealed that this tract could be regarded with suspicion in a large proportion of cases. This large proportion may well have been due, in part, to the fact that the emphasis in respect to treatment had been placed elsewhere, leaving this field open to incrimination along this line. The dysfunctions observed varied from distress after eating, achlorhydria, and obstipation to x-ray evidences of faulty anatomy or physiological dysfunction. It may be remarked parenthetically that, whereas the x-ray studies here referred to cover 300 cases of arthritis, about 500 complete x-rays of the gastro-intestinal tracts of persons suffering from arthritis have been compiled by the writer and his associates and will be made the subject of a later contribution.

In the early stages of the cases studied, dietetic therapy had been practised in only a small percentage, but, in the later stages, the institution of sane but carefully directed dietetics was almost universal. With very few exceptions, these patients were given their entire caloric requirements, so distributed as to supply a full quota of those factors, chiefly vitamins and proteins, which many lines of investigation suggest that they need, and to avoid surfeit of such substances as the concentrated carbohydrate foods. Patients receiving improper diets will often recover, just as they may in the presence of focal infection, but there is some evidence to suggest that, in selected and fully equilibrated cases, a difference of 300 calories may suffice to turn the scale in favor of retrogression or improvement. In many of the cases in the present series, opportunity was afforded to study under exceptionally controlled and sustained conditions the separate influences of a variety of factors,—such as the removal of infection, the use of vaccines, the institution of a balanced diet, the use of drugs, the application of physical therapy, and other measures—upon individuals already fully stabilized by rest in bed over a period varying from weeks to months. The precision of a pure laboratory experiment was thus frequently achieved.

The use of drugs in the treatment of this series of cases was very limited except as regards tonic medication. Very small doses of strychnine were often utilized in conjunction with rest. Sedation was employed occasionally as a help in the inauguration of the initial program. The salicylates were used very sparingly, mostly to meet emergencies. Patients who had been taking fifteen to sixty grains of aspirin a day were nearly always able to dispense with the drug in a week or less. Opiates were never allowed and never needed. The writer is satisfied that in the majority of cases the use of anodynes in arthritis arises from unfamiliarity with the problem.

A great wealth of clinical material of undoubted significance, much of which deserves mention, emerges from a study of any extensive series of the sort under discussion. In this paper, it is the author's purpose to discuss only those findings which cast light upon principles thought to be involved.

In the consideration of the etiology of the two types of arthritis, the statement is often made that infection bears no relation to the hypertrophic variety. This statement is based chiefly upon many justifiable clinical impressions and also upon agglutination tests *in vitro*. Attention is, therefore, directed to the following instance.

Mrs. H., aged fifty-eight, presented a marked hypertrophic arthritis, characterized chiefly by Heberden's nodes, pain in the knees, and general discomfort. Examination revealed six abscessed teeth. The patient refused to have these removed and was treated for exactly one year on the basis of standardized rest, tonic medication, physical therapy, and an adequate but controlled diet. Some systemic improvement was achieved, but the disease was definitely not arrested. The patient's obstinacy finally gave way and during a period of two months, the offending teeth were removed without other alteration in the general regimen. This patient made an immediate response and is now, six months later, wholly free from all symptoms.

Other comparable instances could be cited. It is, therefore, difficult for those desirous of maintaining an open mind toward arthritis to believe that infection plays no etiological rôle in at least some cases of this variety of the disease. Statements that infection induces or precipitates atrophic arthritis alone cannot be accepted with finality.

Again, the view is entertained by some that hypertrophic arthritis is chiefly a function of *age alone*. This view is based largely upon the frequency of evidences of hypertrophy in human beings and in animals, parallel to the passage of years. In refutation of this idea, the following case is reported.

Mrs. W., aged seventy-seven, in comfortable circumstances, presented herself in May 1934, complaining of bent, stiff, painful knees and marked Heberden's nodes. Examination revealed a woman otherwise apparently healthy for her years, definitely without discoverable focal infection. All teeth had been removed some years before. The patient gave a history of colitis fourteen years previously, but, in view of her age, it was deemed wise to omit x-rays of the gastro-intestinal tract.

The therapeutic approach to this individual narrowed itself down to the inauguration of rest periods twice a day, the institution of an adequate but differently balanced diet, improvement of the intestinal function, and the prescription of mild tonic medication in the form of *nuxvomica*. From the outset, improvement occurred,—she progressively lost discomfort in the hands and knees and gained use of the legs.

At present, nearly thirteen months since first seen, the patient has been free from discomfort or disability for six months. The deformities remain visible, but the Heberden's nodes are somewhat reduced in size. At the age of seventy-eight, she is more active than before, insists that she is well, and is with difficulty restrained to a balanced type of life. For the first time in seven years, a ring can be removed from the ring finger and it has become necessary to have two other rings made smaller to avoid their being lost.

Incidentally, it is interesting to note that one son, of flat, slender build, aged forty-three, developed atrophic arthritis coincidentally with convalescence from duodenal ulcer and while following a soft, high-carbohydrate, "ulcer" type of diet at the hands of Dr. H. L. Bockus, who referred him to the writer. This patient has since made a complete recovery.

Those observers desirous of seeing the problem of arthritis *in toto*, find it difficult to believe that age alone explains hypertrophic arthritis. The wide-angled view seems to be that age, as well as trauma, may be a contributory influence toward an early or earlier precipitation of symp-

toms in subjects already presenting a background or an imbalance of physiology favorable to production of the disease. The opposite situation may equally prevail,—namely, an elderly person exposed to precipitating factors *A* or *B* may develop hypertrophic arthritis. The statement is also often made that the hypertrophic arthritic is overweight. Attention is called to the fact that many patients in the present series were characterized by slender bodies.

The statement is sometimes made that the therapeutic principles underlying treatment of the two main types of arthritis are so essentially different as to demand that they be classed separately. This statement is based largely upon the known pathological differences in the two phases of the syndrome, upon the more devastating influences of infection in atrophic arthritis in the young, and upon the accepted importance of avoiding bony ankylosis in cases of atrophic arthritis. In this connection, the following case is of interest.

A young woman of twenty-one years presented atrophic arthritis, characterized by spindle-shaped fingers. She was of the slender, ptotic type, easily fatigued, and is chosen because she presented no focal infection whatsoever, even after having been subjected to an exhaustive examination. She gave a history of long-standing, obstinate constipation and was treated in October 1934 upon the basis of systemic rest in bed, an adequate but balanced diet, improvement of bowel function, and mild tonic medication. Therapy along the above lines resulted in early and marked improvement. She was unable to stay under hospital care as long as desired.

Parallel to this case is the following case.

A French woman, forty-two years of age, presented clear-cut Heberden's nodes and hypertrophic arthritis involving the knees. The tonsils were found to be diseased, but, because of a variety of circumstances, they were not made the object of immediate attack. The patient was given a program of standardized systemic rest periods, twice daily, an adequate balanced diet, and improved bowel control. After two months, she was able to flex her hands freely, was essentially free from pain, and had become an alert and grateful patient. At this juncture, the tonsils were removed.

A review of these two cases, as well as of many others which could be grouped under each head, carries the inescapable implication of some common factors operating in the etiology and in the therapy of these phases of arthritis. Some common denominator in the underlying pathological premises of the two types is also suggested.

Enough has been said, therefore, to indicate that, whereas there are some sharp differences of therapy to be observed,—such as those measures which avoid or postpone ankylosis in atrophic arthritis—a large series of factors, of which physical therapy is probably the chief, have beneficial influences upon each type. The dispassionate view seems to be that unduly rigid crystallization of many phases of therapy around either type alone carries the possibility of injustice to the other type.

It is obvious, however, that great caution must be exercised in the actual application of the various forms of therapy to any individual case. In treating this syndrome, it seems to be almost impossible to advance therapeutic recommendations which are not open to too early or too

generic application, despite the cautions enjoined. The writer is satisfied that inadequate care is exercised in the selection of cases for submission to the several lines of therapy available to arthritics. This situation presents avowed difficulties and requires experience. The removal of focal infection, for example, may be indicated in principle in a given case of either type, but it may be wholly inappropriate in practise. As a matter of fact, in the writer's clinic, focal infection is rarely removed until an "equilibrium" has been achieved, at least as fully as possible, in the various major systems of the body. It is sometimes impossible to remove such focal infection as may be detectable in either type, and yet recovery may be achieved. By the same token, the writer is satisfied that conservative treatment of such tissues as tonsils may often be carried out with gratifying results. He believes that few laryngologists and few internists appreciate that the tonsil is about as amenable to the influence of local treatment, particularly massage, as is the prostate and that, in conjunction with well coordinated and balanced therapy, great benefit can be secured both locally in the tonsil and systemically in respect to the arthritis. There is here a reciprocal relationship.

The writer feels that it is almost impossible to evaluate properly any phase of etiology or therapy in this complicated syndrome except under such sustained conditions of hospitalized equilibrium as to allow of the removal of large and significant variables from the field. Considerable objection has been raised to the use of the word "control" in arthritis. When this problem is conducted along the lines under discussion, experience indicates clearly that at least some of this objection is derived from the fact that the conditions necessary to control are not often at hand. Furthermore, control depends not only upon physical facilities and the potential of the patient for cooperation, but also upon open-mindedness upon the part of the observer. He must be not only theoretically willing, but practically desirous of guardedly bringing to bear upon the arthritic patient the sum total of influences favorably affecting his disturbed physiology. The frequency with which *a priori* convictions operate to defeat this desideratum is in the highest degree costly to the arthritic. Conversely, there is no room for sweeping negative postulates in this developing but profound field. There is an avowed group of ten, perhaps fifteen, per cent of cases which is refractory and there is a group of perhaps two per cent of all cases which defies therapy of all kinds. This fifteen per cent, however, leaves an overwhelming majority of cases amenable to control by any clinic so equipped and so staffed as to be able and to desire to bring to bear this summation of favorable influences.

The profession is still looking at a false horizon over which it hopes some day to see a specific treatment appear. In the opinion of the writer, such hopes are largely unnecessary. There is available already a therapy for arthritics which probably justly deserves to be termed specific, at least as much so as does that for the tuberculous. It depends upon no one factor, but upon an aggregate of factors. It is contingent, con-

fessedly, upon adequate facilities, but it depends more upon an open mind, the desire to bring to bear the various influences available to us, and upon that knowledge, born of experience, which knows how to coordinate these influences. This experience is itself not achieved in a day and it requires time in which to ripen.

The writer tries to keep before himself and before his associates the principles inherent in a maxim of Epictetus which perhaps has nowhere wider application than in the field of arthritis,—“What is the first business of one who studies philosophy? To part with self conceit. For it is impossible for anyone to begin to learn what he thinks that he already knows.”

OBTAINING UNION IN UNUNITED FRACTURES OF THE HUMERUS

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Probably no fracture of any long bone in the body results in non-union more frequently than does fracture in the shaft of the humerus. This fracture is extremely difficult to immobilize, and there is so little muscle tension that nature seems to feel it unnecessary to put forth much effort in the way of immobilizing the fragments by throwing out callus. If the fracture is at the middle of the shaft or above, it is practically impossible to immobilize the upper fragment without immobilizing the shoulder or body, and this procedure is particularly difficult with either splint or cast if the patient is at all fat. Even if he is thin, immobilization is difficult, because, with the body in the reclining position, the arm tends to fall back and become displaced in the splint or cast, thereby causing motion between the fragments. The patient changes the tension on the fragments with every movement of the body. The great adductor muscles which are attached to the upper fragment (pectoralis major, teres major, and latissimus dorsi) tend to adduct the upper fragment, and, when the patient changes the position of the body, the muscles of the shoulder girdle are tensed by the effort of movement, which produces abduction and external rotation. The forearm muscles (brachio-radialis or supinator longus, as well as the flexors and extensors which originate on the condyles of the humerus) have a tendency to pull the lower fragment forward, and the only muscles which put tension on the fragment in a way which would ordinarily cause overlapping are the biceps and triceps. The triceps, however, by its contraction may act as a posterior bowstring, angulating the fracture anteriorly. It is known that the adductors play a similar rôle in lateral angulation of fractures of the mid-shaft of the femur. It can be readily seen, therefore, that the greater tendency for displacement of both fragments is toward constant angulation, with little or no tendency to put weight-bearing strain on the bone, while it is a matter of common knowledge that fractures which are slow to unite are given stimulation in this direction by weight-bearing to withstand the pull of the muscles attached at or near the ends of the long bone which is fractured.

In our opinion these two factors are largely responsible for non-union in fractures of the shaft of the humerus, especially those which occur in the middle third. The methods advocated for repair have been many. The inlay bone graft¹, the onlay bone graft², the mortise, the osteoperiosteal graft^{3,4}, the step approximation⁵, or a combination of any of these, have all been tried with greater or less success.

We report herewith six cases of ununited fracture of the humerus, varying in time of duration from one year to five years, in patients whose ages ranged from twenty-six to sixty-nine years. In two of these cases, permanent non-union has resulted from the bone-graft method, and in three there has been firm bony union in less than three months following operation by the method described in the following case reports. In one case (Case 6) the bone graft was applied in such a way that it was sustaining weight constantly, and in this case union resulted.

CASE 1 I J, a female, twenty-eight years of age. On August 20, 1926, the patient had sustained a fracture at the juncture of the upper and middle thirds of the right

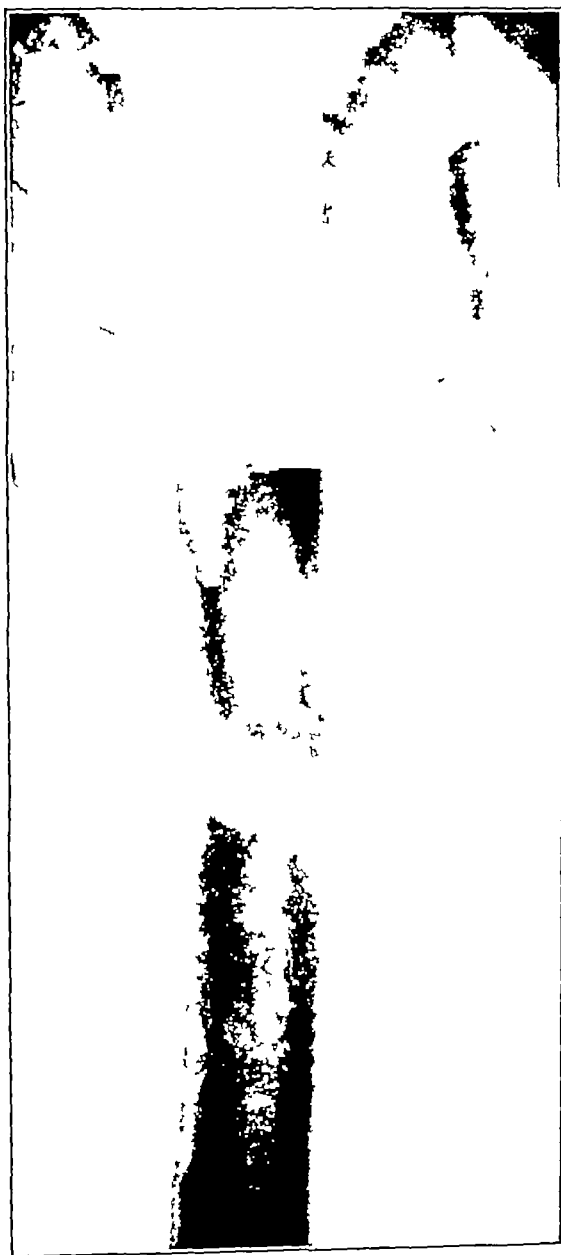


FIG 1

Case 1 First non-union after closed reduction

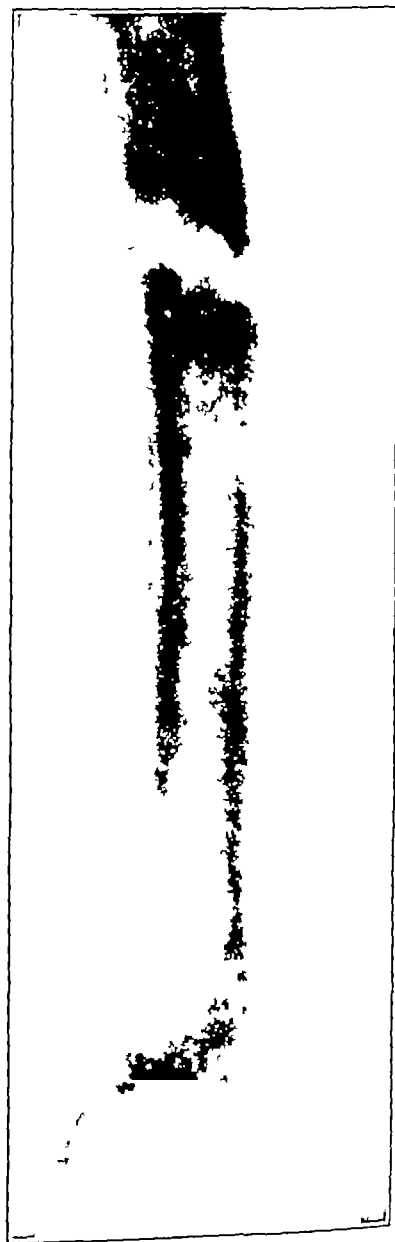


FIG 2

Case 1 End result after first operation

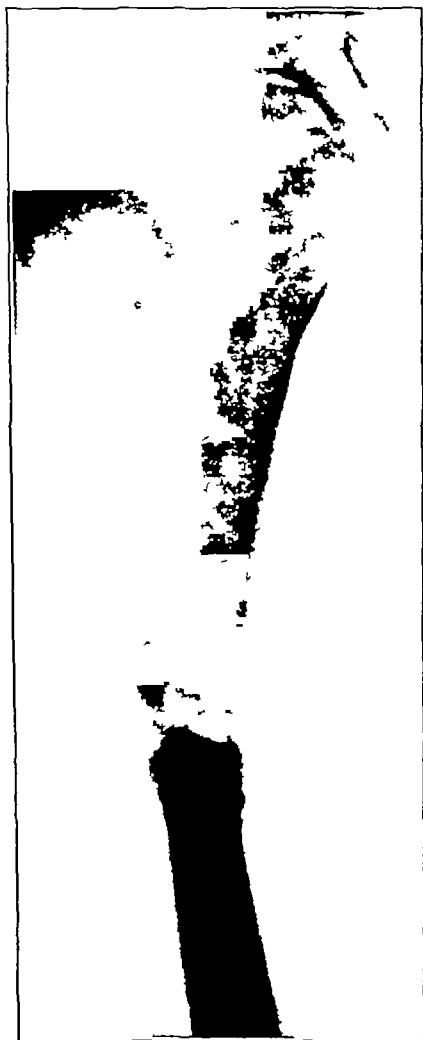


FIG 3

Case 1 End result after second operation



FIG 4

Case 1 After third operation In this case, progressive absorption of the fragment ends and graft took place

humerus The fracture was treated by closed reduction and the roentgenogram (Fig 1), taken on February 23, 1927, shows non-union of the fragment

An operation was performed at Wesley Memorial Hospital on March 3, 1927, when a lateral incision was made and the ends of the fragments were thoroughly cleared of

scar tissue The ends were beveled obliquely and held together with two ivory screws Immobilization was secured by the application of a molded splint over the shoulder, upper arm, and forearm laterally, and a pad and molded splint medially

The arm was held in this splint until August 17, 1927, when a second operation was decided upon because of absorption of the ends of the fragments and complete separation of the ends (Fig 2) There was no infection or apparent irritation, simply an osteoporosis at the ends of the fragments At this time, the arm was opened again, the ivory screws were removed, the fibrous tissue was again cleared out, and the ends of the bones were freshened until active bleeding was encountered The medullary cavity was opened thoroughly and an iliac graft, removed from the tibia, was applied A special splint was made to immobilize the shoulder girdle, body, upper arm, and forearm, with a support for the hand This splint was worn until October 1929, during which time there was a



FIG 5

Case 2 After accident



FIG 6

Case 2 Showing non-union

gradual absorption of the ends of the fragments and the graft, and again no union resulted (Fig 3)

On October 8, 1929, a third operation was performed. Again the ends of the fragments were cleaned off down to what appeared to be healthy bone, and this time a double onlay graft was applied, one on each side of the humerus, and held in place with ivory screws which practically bolted the two grafts together, holding the fragments between them (Fig 4). The fixation was so strong that there was absolutely no play between the fragments and the graft. As a result of these three operations, the humerus was shortened almost two and one-half inches. The same type of immobilization was applied around the body, shoulder girdle, arm, and forearm, and again progressive absorption occurred in the grafts and the ends of the fragments, and at the date of this writing, February 1935, the absorption has progressed until there is no evidence of the graft, although the ivory screws can be seen in the location in which they formerly held the graft. On last examination, about a year ago, the ends of the fragments showed progressive absorption.

CASE 2 F W, a female, sixty-nine years of age. This patient had sustained a comminuted fracture of the right humerus in July 1931. In addition to the two main fragments, this fracture showed a triangular fragment, lying just above the lower main

fragment and medial to it, and a long triangular fragment from the upper main fragment, lying lateral to it (Fig 5). At the time this patient came under observation, one year after the injury, the two smaller fragments had united to the upper fragment, but the lower main fragment had not united (Fig 6).

An operation was performed on July 14, 1932. A lateral incision was made. The two smaller fragments were found firmly united to the upper fragment and were not disturbed. A well developed pseudarthrosis was found to exist between the upper and lower fragments. The fibrous tissue was thoroughly excised and the ends were resected until fresh bleeding bone was exposed. The ends were beveled to increase the contact surface between the fragments, and the fragments were transfixed with ivory screws which held them firmly in position. An osteoperiosteal graft, taken from the tibia, was then wrapped completely around the bone, extending well above and below the end of each fragment. There was a slight skin infection involving part of the subcutaneous fat. This was opened on the fifth day and was completely closed twelve days following its appearance.

The patient was obese and it was recognized that no fixation apparatus, such as a cast, could be made which would allow her to be comfortable. Therefore, before operation, an aluminum splint was made in two parts,—the lower part fitted perfectly around the body under the humerus, with a support for the hand, and the upper part was fitted over the lateral surface of the arm, extending up onto the shoulder, the anterior and posterior chest wall, and around the neck. The upper part could be fastened firmly to the lower part. This splint was the most perfectly fitting and completely immobilizing apparatus which we have ever seen applied to the shoulder and arm.

The arm was held in immobilization in the aluminum splint for one year, at the end of which time there was absorption in the ends of the fragments (Fig 7). The patient refused to wear the splint longer and it was felt that nothing could be gained by advising her to continue with the immobilization. This patient has been seen at intervals of from one to three months since the splint was removed, at the time of this writing two years and seven months have elapsed.

A year and a half after the operation, a sinus appeared at about the middle of the scar. This was very small, caused no pain, no temperature, and no increase in leukocyte count,

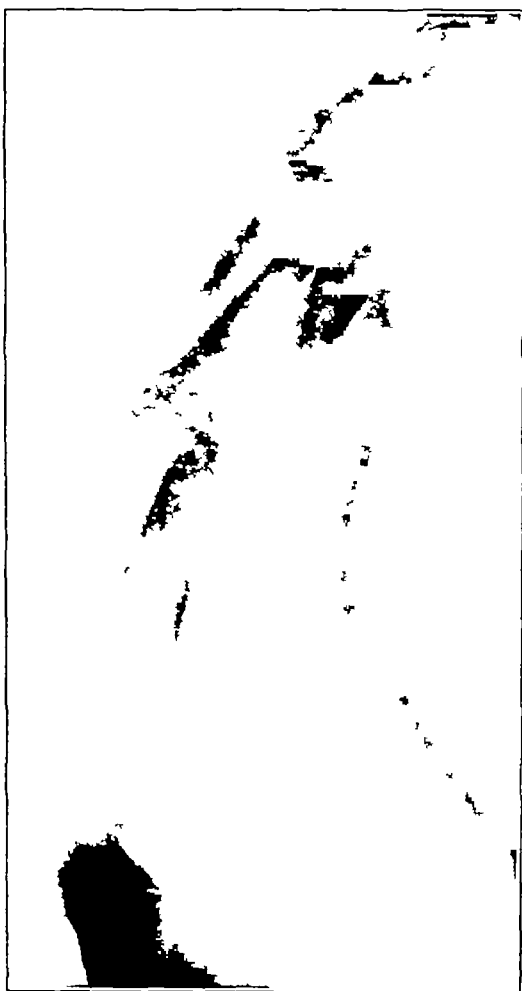


FIG 7

Case 2 After operation Absorption of the fragment ends and graft, one year later

but continued to open and close until two months ago, when a fine probe disclosed some hard substance within the sinus. It was opened and one of the ivory screws which had been used at the time of operation was removed. The sinus closed within a few days and has remained closed. This sinus was doubtless caused by the effort of the tissues to extrude a foreign body, but there was no infection until one year and a half after operation.

CASE 3 J O C, a male, fifty-six years of age. This patient had sustained a compound fracture of the mid-shaft of the right humerus on August 16, 1931. After immobilization in a cast for thirteen weeks, an operation had been performed on November 15, 1931. When the patient came under our observation in September 1932, there was no union between the fragments (Figs 8-A and 8-B).

At operation, September 6, 1932, a longitudinal incision was made and the ends of the fragments were thoroughly cleared of fibrous tissue. Into the lower end of the upper fragment a long V was cut and the lower fragment was trimmed off to the shape of a wedge to fit the V. This was done with a thin-bladed sharp chisel. The fragments were then held together by drilling through above the middle of the V and the middle of the wedge, and passing a malleable iron wire through the upper fragment, bringing it down

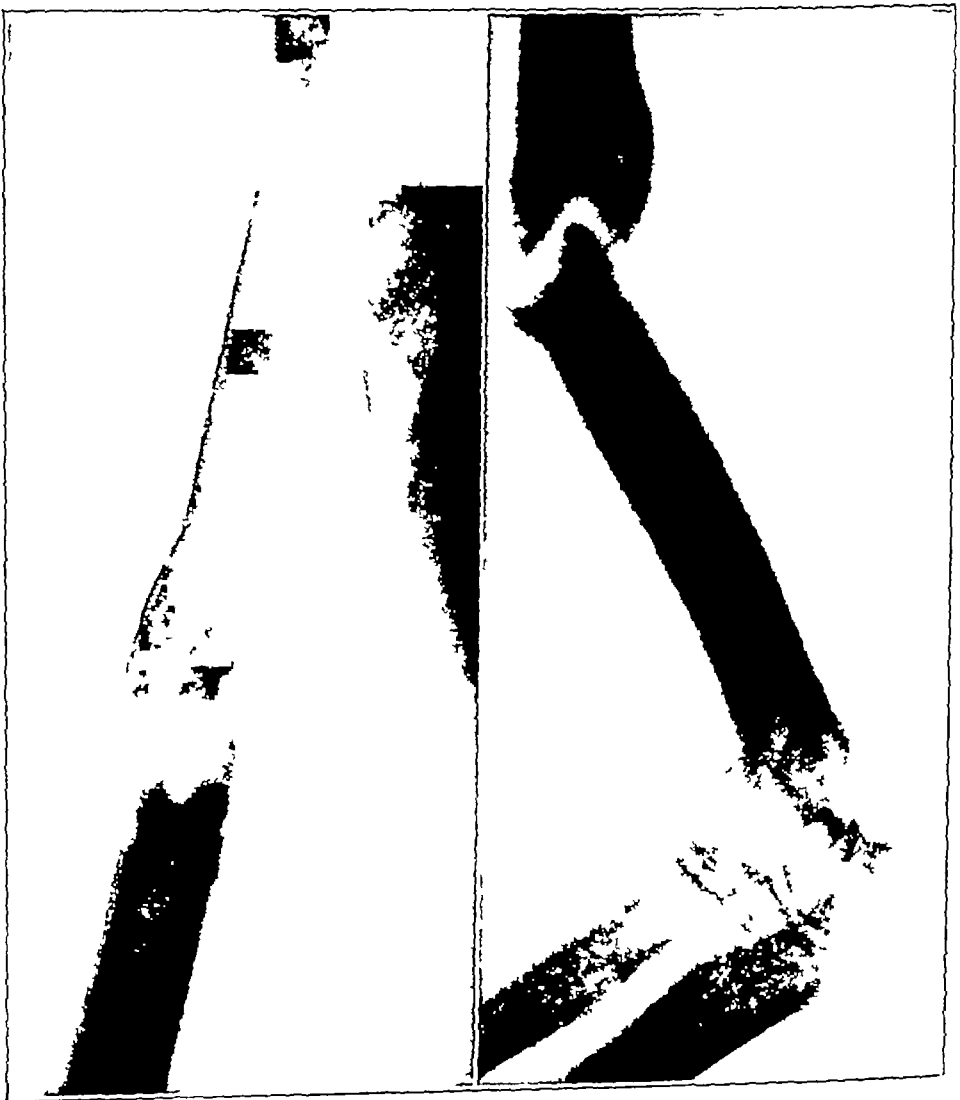


FIG 8-A

Case 3 Before operation, showing non-union

FIG 8-B



FIG 9-A

FIG 9-B

Case 3 After operation, showing firm union

through holes in the wedge in the lower fragment and then up through the upper fragment, making a U of the wire which constantly tended to pull the fragments together. An osteoperiosteal graft was placed around the defect in the bone and sutured with catgut.

The patient was placed in an abduction splint which was supported by the chest wall and held firmly against it by a strap over the opposite shoulder. The arm was bandaged onto this splint. The apparatus was adjusted from time to time to keep it snug, but no effort was made to bind the arm snugly to the splint, because it was felt that the constant change in position of the splint, with the resultant tugging on the arm, might contribute to non-union. The apposition of the bones remained snug from the time of operation until complete union occurred, when the patient was discharged. At no time could there be felt any movement at the junction of the ends of the fragments.

The splint was removed at the end of eight weeks, when the x-ray showed substantial callus formation. The arm was supported by short splints on the flexor and

extensor surfaces The elbow was allowed to be unsupported after this, and the patient was encouraged to use the arm These splints were removed after four weeks when it was decided that union was complete Because of the fact that no motion could be felt between the fragments, the abduction splint was removed probably a little too early A slight angulation occurred after the short splints were applied, which may have been due to the fact that the patient, a stone contractor, occasionally took a heavy mallet in the hand on the injured side to show the workmen what he wanted done This was within twelve weeks of the time of operation, and, had not the mechanical union of the fragments been so firm, permanent damage might have resulted As it was, only a slight angulation occurred and union progressed (Figs 9-A and 9-B)

CASE 4 J Z, a male, thirty-three years of age A fracture about the juncture of the middle and lower third of the left humerus had been sustained on December 6, 1933 A splint had been applied three weeks after the injury, and, on February 14, 1934, a steel plate had been applied Immobilization had been continued until July 1934, at which time the patient came to the authors with a complaint of non-union (Figs 10-A and 10-B) There had been no infection and the plate was reasonably firm

An operation was performed on July 16, 1934 The radial nerve was dissected free



FIG 10-A

FIG 10-B

Case 4 Before operation, showing steel plate with angulated fragments and loose screws Note broken drill point

A tremendous amount of scar tissue was encountered around the end of the lower fragment. The plate was removed, the screws being freed without effort. A drill point, encapsulated and apparently causing no damage, was found near the end of one fragment. The ends of the fragments were thoroughly cleared of fibrous tissue, a long V was cut in the lower end of the upper fragment, and the upper end of the lower fragment was shaped into a wedge which fitted this V accurately. The fragments were held together by two ivory nails driven through at different angles.

The patient was placed in an abduction splint and the arm was bandaged to the splint. No osteoperiosteal graft was used to surround the fragments. The splint was removed on September 25, 1934, when bony union was found to exist. At no time could any movement be felt between the fragments. The patient was able to lift his arm off the splint without pain within four weeks of the time of operation, and insisted that it was solid long before the splint was removed. The splint was removed seventy-two days after operation when there was ample x-ray evidence, as well as clinical evidence, that complete bony union had resulted (Figs 11-A and 11-B).

CASE 5 S N, a male, twenty-six years of age. This patient had sustained a fracture of the mid-shaft of the right humerus in July 1929, at which time there was a radial nerve injury. He stated that union had occurred within two months, but that there had been no change in the radial-nerve symptoms. Six months after the original injury he had fallen, again fracturing the humerus. At this time the fracture and the radial nerve were both exposed, the fracture was supported by a wire loop running between the fragments, and the nerve was repaired. The nerve had regenerated within

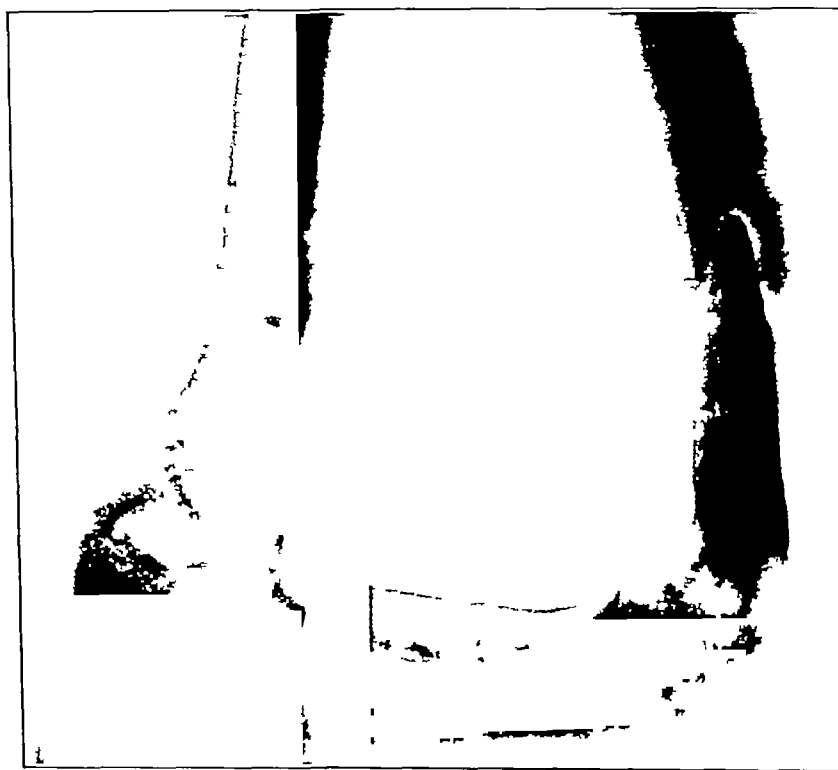


FIG 11-A

Case 4 After operation

FIG 11-B

Splint removed

Clinically solid union

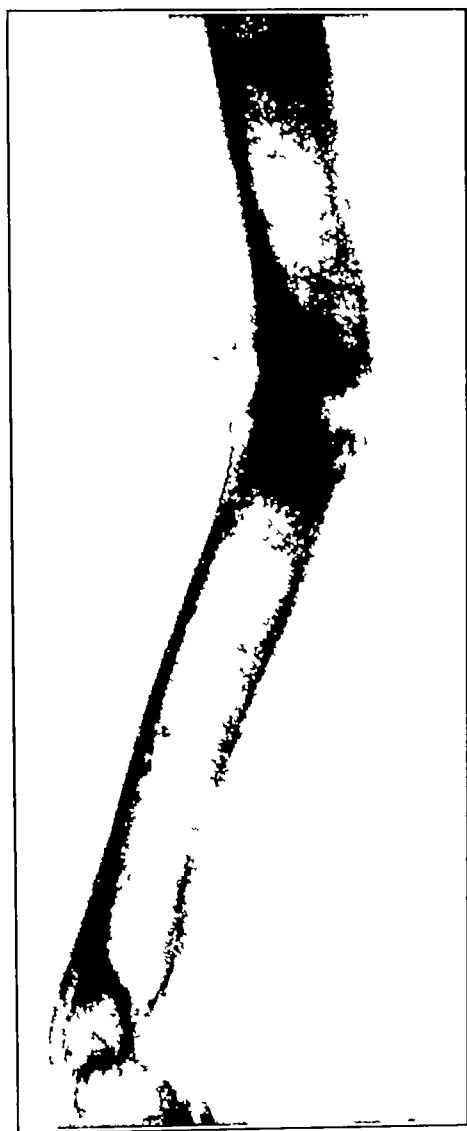


FIG 12-A



FIG 12-B

Case 5 Before operation, showing non-union with fragmentation of light wire

about nine months, but no union had occurred in the fracture. The patient came to the authors in February 1934, four years and six months after the original injury and four years after the second fracture. At this time, there was complete control of the muscles supplied by the radial nerve, but there was a false joint at the site of fracture (Figs 12-A and 12-B).

An operation was performed on February 16, 1934. The radial nerve was exposed and was found to run through a rather dense tunnel of fibrous tissue. It was dissected free well above and below the fracture. Dense fibrous tissue was found around the ends of the fragments, with a pseudarthrosis between them. The fibrous tissue was well cleaned out and the bones were freshened. In the lower end of the upper fragment, a long V was cut, and the lower fragment was shaped as a wedge to fit the V. These fragments were held together by iron wire passed through drill holes and holding the lower fragment well up into the upper fragment. The nerve was transplanted, the triceps and brachialis anticus being pulled between it and the bone and sutured together.

The patient was placed in an abduction splint and the arm was bandaged to the splint. At no time after the operation could any motion be felt between these two fragments. No osteoperiosteal graft was placed around this bone defect. There was ample

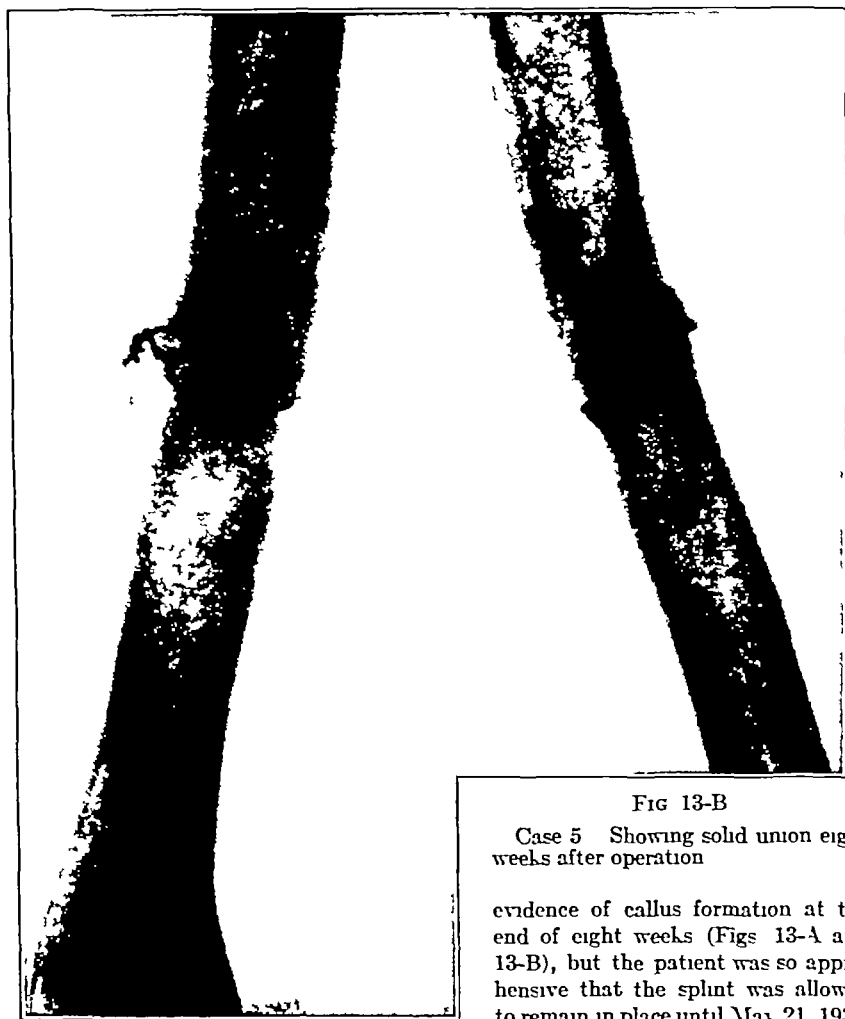


FIG 13-A

FIG 13-B

Case 5 Showing solid union eight weeks after operation

evidence of callus formation at the end of eight weeks (Figs 13-A and 13-B), but the patient was so apprehensive that the splint was allowed to remain in place until May 21, 1934, ninety-five days after operation. The union was solid and the x-ray showed a firm union between the fragments.

CASE 6 J F O, a male, twenty-eight years of age. This man had sustained a compound comminuted fracture of the lower half of the left humerus on August 14, 1932. A thorough débridement was done at the time and many fragments of bone were removed, including much of the lower end of the humerus. There was remarkably little infection, considering the tremendous trauma and the large compound wound. The wound had healed within two months, after which a right-angle splint had been applied, but the whole lower third of the humerus was absent and no bony contact whatsoever could be established (Fig 14).

The patient was admitted to Passavant Hospital on November 15, 1933, at which time there was complete absence of bone in the lower third of the humerus, and he was unable to flex or extend the elbow except by gravity (Fig 15). The muscles of the upper arm contracted and lifted the elbow two inches toward the lower end of the upper fragment, but, obviously, this had no effect on the flexion of the joint.



FIG 14

Case 6 Showing condition of arm shortly after injury



FIG 15

Case 6 Showing condition of arm when first seen by the authors

A transverse incision was made over the lower end of the upper arm, and what seemed to be the remains of the triceps muscle was reflected upward. It was not attached to the olecranon and there was no evidence that a normal olecranon was present. Neither the radial nor the ulnar nerves could be found. All scar tissue between the lower end of the upper fragment and the radius and ulna was removed, and the lower end of the upper fragment was freshened. The head of the radius was excised. The remains of the internal and external condyles of the humerus were found, but not freed, although one surface was freshened. A graft, seven and one-half inches long, was removed from the tibia in such a way that the part taken from the upper end of the tibia was much wider than the balance of the graft. This was for the purpose of giving a wider surface at the elbow in the hope of forming something that simulated the lower end of a humerus. The upper fragment of the humerus was then split, and a greenstick fracture was created at the upper end of the split through one side of the bone. The heavy graft was then in-

serted deep into the split, the lower end of the graft being pushed down firmly against the radius and ulna in order to gain length and to put longitudinal pressure on the graft, with the idea of gaining a weight-bearing surface and lengthening the upper arm. This pressure was maintained between the lower end of the graft and the upper end of the radius and ulna, stretching the upper arm muscles to their full extent, while the graft was clamped in place between the two surfaces of the upper fragment and fastened with two ivory screws. These screws, passing through at practically right angles to the long axis, penetrated the graft and both halves of the upper fragment. Since no remnants of the olecranon were found, the triceps was then attached to the upper end of the ulna, and was held to the freshened surface of the upper end of the shaft by heavy silk sutures. The brachioradialis, supinator brevis, and pronator teres were attached to each side of the graft by sutures. The arm was then put up in 45 degrees of flexion and in semipronation. The skin was closed, and it was noted when the flap was closed that, instead of a transverse incision, there was apparently a curved flap with a concavity downward.



FIG 16-A

Fig 16-B

Case 6. After operation.

The patient was discharged from the hospital on November 29, 1933, wearing a brace which allowed motion at the elbow. Motion was started within two weeks after operation, but the brace was worn until June 1934, a total of six months. X-rays made at intervals showed progressive improvement in the circulation, and enlargement of the diameter of the graft was shown within six months, although union between the graft and the upper fragment occurred within three months (Figs 16-A and 16-B). At this writing, the patient is wearing no brace or support and has more than 90 degrees of voluntary motion, power to flex and extend the arm, and about 35 per cent of normal pronation and supination (Figs 17-A and 17-B). The muscle control of the forearm and hand is almost perfect. The x-rays show a widening of the lower end of the humerus, which was the lower end of the graft, and the pieces of the medial and lateral condyles, which were very much atrophied, have developed

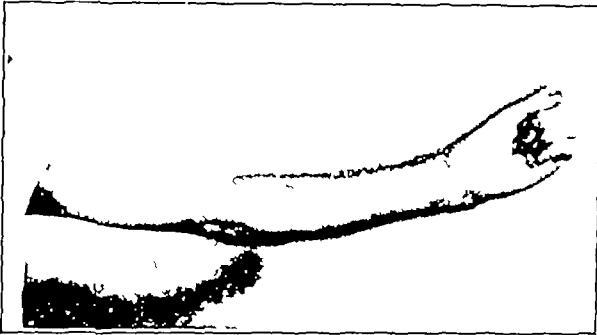


FIG 17-A

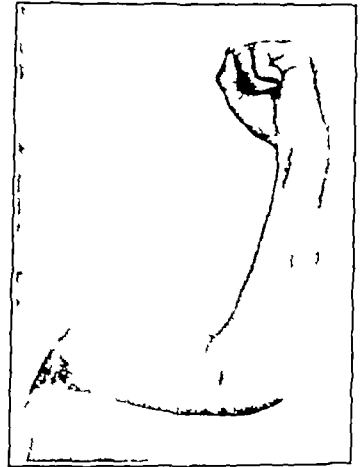


FIG 17-B

Case 6 Showing movement in elbow and stability, nine months later

It is realized that six cases do not comprise a large series from which to draw conclusions, but it seems logical to assume from the histories of Cases 3, 4, 5, and 6 that the firmness of the mechanical union at the time of operation, in addition to the fact that a very large surface on each fragment came in contact with the opposite fragment, had something to do with the rapidity of union which occurred in each of these cases. The mechanical support was ideal. No motion was allowed between the fragments which would have a tendency to break up forming or newly formed callus, and the main shaft of the bone supported strain and muscular pull much more firmly because of the wedging of the fragments into each other. In Case 6, while the long bone graft was attached at only one end, there was a very large surface of the graft in contact with normal healthy bone, and the mechanical union of this graft to the bone was perfect. This graft undoubtedly sustained a longitudinal strain because of pressure between the forearm and the upper fragment of the humerus, produced by stretching of the muscles of the upper arm (biceps and triceps). Because of this firm mechanical union, motion could be started early and could be continued.

Therefore, in treating fractures of the humerus, it seems to be important that the fragments be held in position by some method which will produce strain on the bone, as that of weight-bearing, without allowing angular motion between the fragments. This can best be done by

uniting the fragments in such a way that the bone itself supports a considerable part of the lateral strain without allowing motion. It is practically impossible to support the upper arm with any external fixation without motion between the fragments, which is caused by muscular effort in moving the body with a constant tendency to pull the fragments out of position. We believe it is important to fit the fragments together very carefully, and a nice bit of cabinet making is involved in this procedure.

REFERENCES

- 1 HENDERSON, M. S. Autogenous Bone Transplantation. *J. Am. Med. Assn.*, LXXVII, 165, 1921.
- 2 CAMPBELL, WILLIS. The Onlay Graft in the Treatment of Ununited Fractures of the Long Bones. *Southern Med. J.*, XX, 107, 1927.
- 3 THOMAS, H. B. The Treatment of Old, Ununited Fractures of Long Bones. With Special Reference to the Use of Osteoperiosteal Graft. *J. Am. Med. Assn.*, LXXX, 309, 1923.
- 4 DELAGENTÈRE, H. De la greffe ostéo-périostique. Ses applications en chirurgie et ses résultats d'après 296 observations. *Bull. Acad. de Méd., Paris*, LXXXVIII, 396, 1922.
- 5 SEVER, J. W. Nonunion in Fracture of the Shaft of the Humerus. Report of Five Cases. *J. Am. Med. Assn.*, CIV, 382, 1935.

RECURRENCE IN DISLOCATION OF THE CERVICAL SPINE

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Ample experience has already been accumulated to establish the efficacy of the method for the treatment of dislocations of the cervical vertebrae described by Taylor ^{1, 2}. This method consists of continuous traction on the recumbent patient's head, produced by a sling around the surgeon's waist, and maintained until the cervical muscles have relaxed, at which time the reduction can be carried out bimanually by hyperextension. The spine is then immobilized in a plaster splint which extends from the lumbar region upward, including the head and neck. By early anatomical restoration and by thorough fixation, damage to nerve tissues from direct pressure on the roots or on the cord or pressure from oedema can be relieved.

A certain number of dislocations which have had apparently satisfactory reductions unfortunately recur, or at least develop an angulation at the site of injury. This tendency toward recurrence or angulation results from factors inherent in the pathological changes caused by the injury and also from technical difficulties which cannot be overcome by an inelastic plaster dressing. The structural causes of recurrence are extensive tearing of the supporting ligaments, crushing of the intervertebral discs with loss of their elastic cushioning, and, lastly, injury to the bony structures. Because of these pathological conditions, little resistance is offered to the deforming stresses of gravity and pull of the muscles.

The objections to the plaster splint are obvious. It is supposed to press "upward against the occiput and mandible, and downward against the shoulders." This description suggests that the shoulders must be points of counter pressure. It should be remembered, however, that the shoulder girdles are loosely attached to the chest wall, allowing considerable latitude of motion so that, when any downward force is exerted, the shoulders yield. This mobility and elasticity of the shoulders make their use as points of counter-pressure unreliable.

The two factors which are indispensable to the maintenance of correction are (1) retention of the neck in complete hyperextension, and (2) continuance of consistent longitudinal traction.

To fulfil these requirements without losing the advantage of complete splinting, the author has modified the plaster dressing by wedging it anteriorly and by applying two turnbuckles which will open the wedged area (Figs 1-A and 1-B). Postoperative roentgenograms should be taken at frequent intervals in order to check any change in position. If angulation or deformity appears, the turnbuckles can be tightened in

order to maintain the maximum traction and hyperextension that can be tolerated by the patient. The use of a wedged body jacket with turnbuckles in the treatment of compression fractures of the dorsal and lumbar regions has also been proved of value by Linde³. The method used by the author is well illustrated by the following case.

Mr. S, aged forty-five, had fallen from a wagon and had been trampled upon by horses. He had sustained lacerated wounds of the scalp and a cervical injury which had been overlooked by the attending physicians. He came under the author's observation about four weeks after the accident. At this time, roentgenograms showed a fracture-dislocation of the fifth cervical vertebra on the sixth (Fig. 2). The dislocation was reduced by manipulation and held by the application of a plaster jacket. On the fifth day, roentgenograms showed recurrence of the forward displacement of the fifth vertebra, amounting to one-eighth of an inch, and also some narrowing of the intervertebral disc. The cast was then wedged in the cervical region at the level of the fracture and turnbuckles were applied. The anatomical result two weeks afterward was excellent (Fig. 3), and the position was maintained, as shown by the roentgenogram taken three months after reduction (Fig. 4).

The turnbuckles are now applied in all cases at the time of reduction, as by this means it is possible to correct any change in the relation of the



FIG 1-A

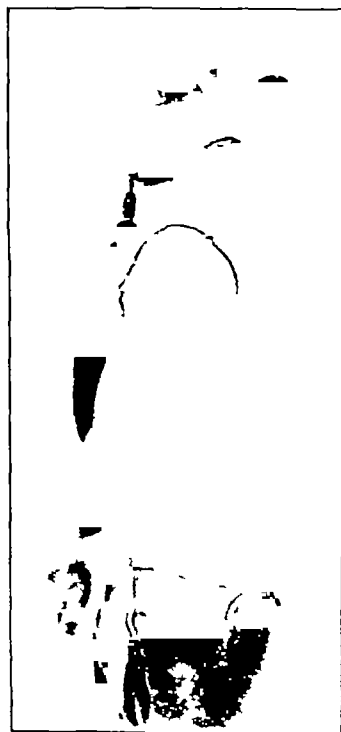


FIG 1-B

Showing cast with two turnbuckles attached to obtain increasing hyperextension of cervical spine. Lateral motion of head is prevented by medial inclination of turnbuckles.



Fig 2

Lateral bilateral dislocation of fifth cervical vertebra of four weeks' duration



Fig 3

Same case as shown in Fig 2, four weeks after complete reduction of the dislocation. The turnbuckles are incorporated in the cast

vertebrae Immobilization with the appliance described should be maintained for a period of at least twelve weeks, after which it has been the writer's custom to provide the patient with a lighter collar for another five or six weeks

A series of twenty-two cases of fracture-dislocation of the cervical spine has been studied Five patients died as a result of shock and other causes Of the remaining seventeen cases, in all of which reduction was done, five patients had recurrences Three of these patients were treated by the method outlined in this paper, which resulted in two perfect reductions and one failure The patient in whom the reduction was not satisfactory, however, was not seen until five and one-half weeks after the



FIG 4

Same case as shown in Figs 2 and 3, three months after reduction of the dislocation A bridge of newly formed bone has formed between the anterior surfaces of the fifth and sixth cervical vertebrae, the alignment of which is perfect

accident and reduction could not be accomplished by any method. It was, therefore, hardly a fair test of the procedure.

Towne⁴ had two recurrences in a series of nine cases treated by the modified Taylor method. Brookes⁵ reports recurrences in ten per cent of his cases.

Statistics having to do with the frequency of recurrence following a reduction of a cervical dislocation vary and depend to a great extent upon the standard of reduction which is considered satisfactory by the surgeon. The author has considered any deviation of the anterior border of a cervical vertebra from the line formed by the vertebrae above and below it as representing either an incomplete reduction or a recurrence. Angulation is particularly undesirable. The files of any Industrial Accident Commission bear witness to the high disability rating which is received by a patient having an incompletely reduced cervical dislocation. We should, therefore, strive for perfection in our treatment of this very serious condition.

CONCLUSIONS

Continuous hyperextension and longitudinal traction may be maintained after reduction of a fracture-dislocation of the cervical spine by the application of a plaster jacket with a head piece and by wedging with turn-buckles. This method is efficacious in the prevention of recurrences as well as in the reduction of certain fractures.

REFERENCES

- 1 TAYLOR, A. S. Fracture-Dislocation of the Neck. A Method of Treatment. Arch Neurol and Psychiatry, XII, 625, 1924.
- 2 TAYLOR, A. S. Fracture Dislocation of the Cervical Spine. Ann Surg, XC, 321, 1929.
- 3 LINDE, F. C. Personal communication.
- 4 TOWNE, E. B. Injuries of the Spinal Cord and Its Roots Following Dislocation of the Cervical Spine. Surg Gynec Obstet, LVII, 783, 1933.
- 5 BROOKES, T. P. Dislocations of the Cervical Spine. Their Complications and Treatment. Surg Gynec Obstet, LVII, 772, 1933.

GAS GANGRENE AND GAS INFECTIONS*

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Any one who is called on to treat injuries incurred in such a manner as to permit the entrance of soil into the wound is probably more or less familiar with the condition commonly known as "gas gangrene." The presence of the organism or organisms causing this condition should always be suspected, and, in the event of evidence of such infection in a compound fracture or other wound, it would seem wise to regard it as a possible etiological factor.

It has been thought that the diagnosis in such cases could be made by the odor, which is said to be characteristic. In many instances, this is true, however, in some cases, it is not true and, if one were to depend on odor alone, one might fail to make the correct diagnosis. The reports of two cases will serve to illustrate this point.

CASE 1 A man, aged sixty years, caught his foot in a corn shredder. He suffered a compound fracture of the first and second metatarsals and of the phalanges of the first and fifth toes on the right foot. Débridement was performed and the fractures were reduced. Tetanus antitoxin (1500 units) was given. On the fourth day, the pulse rate and temperature increased and there was severe pain and discoloration of the toes. Smears from the wounds revealed organisms resembling *Clostridium welchii*, and the leg was amputated above the knee. The patient recovered.

CASE 2 A man, aged fifty years, had fallen from a load of hay a week prior to his admission to the hospital and had injured his thumb, cutting the palmar surface. He thought that he had dislocated it. No improvement had resulted from treatment at home.

On admission, there was a firm, oedematous swelling of the thumb with some yellowish discoloration at its tip, suggesting pus under the skin. Incision, however, failed to reveal any pus. The patient was given tetanus antitoxin. The oedema gradually spread to the hand and forearm and finally to the shoulder. Two blood cultures were negative. There was never any suggestion of gas in the exudate and no crepitus. *There was no odor.* The temperature on admission was 101 degrees, it dropped to normal on the second day and remained there during the eight days in which the patient was in the hospital, going below normal on the last day. The pulse rate was not much elevated until the day of the patient's death, when it rose sharply. At the end of the seventh day in the hospital, or about two weeks from the time of the injury, the patient rapidly went into collapse and died within twenty-four hours. Post-mortem examination revealed nothing remarkable except that cultures from the wound showed an organism of the *Vibrio septique* type.

Thus we have two very different clinical pictures caused by very similar organisms,—that is, *Clostridium welchii*, or the gas bacillus, and *Clostridium oedematis maligni*, or *Vibrio septique*. Certain facts regarding the organisms may be of interest in correlating the clinical findings in these cases. For this reason, a group of anaerobic spore-bearing

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bacilli (after Weinberg and Séguin¹) have been tabulated (Table I) According to most bacteriologists, several of these organisms are often found in cultures from the same wound Some of them are unquestionably pathogenic, but others are saprophytic It is interesting to note that the gas is produced mostly by a non-pathogenic or saprophytic organism *Clostridium welchii*, however, is the organism found most frequently and is one of the most pathogenic

Vibrio septique, or *Clostridium oedematis maligni*, while not found

TABLE I
SOME ANAEROBIC BACILLI (WEINBERG AND SÉGUIN¹)

1	<i>Bacillus perfringens</i> —Veillon and Zuber, 1897 (pathogenic) <i>Bacillus aerogenes capsulatus</i> —Welch and Nuttall, 1892 <i>Bacillus phlegmonis emphysematosae</i> —Eugene Fraenkel, 1893 <i>Bacillus welchii</i> —Migula, 1900
2	<i>Vibrio septique</i> —Pasteur, 1881 (pathogenic) <i>Bacillus des malignen Oedem</i> —Koch, 1881
3	<i>Bacillus sporogenes</i> —Metchnikoff Most frequent of the organisms in war wounds Cause of fetidness (saprophytic)
4	<i>Bacillus putrificus</i> —Biestock, 1884, as <i>Bacillus putrificus coli</i> Occurs in intestines of the cadaver (saprophytic)
5	<i>Bacillus tertius</i> —Henry Found in war wounds,—that is, after <i>Bacillus perfringens</i> and <i>sporogenes</i>
6	<i>Bacillus bifermentans</i> —Tissier and Martelly, 1902 Found frequently in markets in meats in first stages of putrefaction (saprophytic)
7	<i>Bacillus oedematis</i> —Weinberg and Séguin Pathogenic for man and animals
8	<i>Bacillus fallax</i> —Weinberg and Séguin Found in some cases of gas gangrene
9	<i>Bacillus aerofoetidus</i> —Weinberg and Séguin Found in four cases of gas gangrene
10	<i>Bacillus histolyticus</i> —Weinberg and Seguin Found in eight cases of gas gangrene (pathogenic)

so frequently, is in many instances even more serious One author states that infections by this organism cannot be cured and are 100 per cent fatal Another states that this organism is found in 10 per cent of cases of gas gangrene Whether or not this is true, it is important to know that infections by this organism alone may occur, and that in these infections the clinical picture is not at all the same as "gas gangrene"

Bacillus sporogenes is very commonly found in cultures It is not, however, pathogenic, but is responsible largely for the putrid odor so commonly associated with these wounds *Bacillus oedematis* is a

pathogenic organism of importance, as is also *Bacillus histolyticus*. When injected into animals, the latter causes extensive destruction of the soft tissues down to the bone, and it may be regarded as responsible for much of the destruction of tissue when it is found in wounds. Other organisms of less importance occur, some are pathogenic, some saprophytic.

Thus it will be seen that, if this subject is to be approached from a scientific standpoint, it must be remembered that there are several or-

TABLE II

CASES OF GAS GANGRENE AND INFECTIONS WITH GAS BACILLI (*CLOSTRIDIUM WELCHII*)
ENCOUNTERED IN FIVE-YEAR PERIOD

Causative (or Preceding) Factors	No. of Cases	
Following trauma		
Compound fractures	9	
Injuries to soft parts	<u>7</u>	16
Metastasis, primary source unknown		3
Following amputation		
Thrombo-angitis obliterans	3	
Arteriosclerosis (with diabetes)	<u>2</u>	5
Following operation		
On stomach	3	
For intestinal obstruction	2	
Colostomy and resection	1	
Cystostomy	1	
For perinephritic abscess	<u>1</u>	8
Abortion		1
Total		<u>33</u>
Patients recovered	19	(57.5 per cent.)
Patients died	14	(42.5 per cent.)

ganisms to be dealt with, some of which are pathogenic and some of which are not. There may be cases in which infection is produced by this group of organisms without the presence of the supposedly characteristic odor, and again there may be some infections in which there is no evidence of gas (Table II).

These thirty-three cases of gas gangrene and gas infection which were encountered at The Mayo Clinic in a five-year period represent a variety of causative factors. As would be expected, compound fractures produced the largest number of infections, although wounds of the soft parts were not far behind. Either of these may be said to be the commonly known types of trauma from which gas infections may develop. Any one doing many amputations for gangrene due to thrombo-angitis obliterans, or for gangrene due to arteriosclerosis with diabetes, has probably seen the

occasional instance of gas infection in the stump. It is a disturbing complication which may take place frequently enough to justify administration of a prophylactic dose of gas-gangrene antitoxin before amputation is undertaken.

Besides these groups, two cases of spontaneous abscess in the soft parts and one case of pneumonia, in which *Clostridium welchii* was isolated from the sputum, are of considerable interest. In the first two cases, there was no history whatever of injury. In one case, there was an abscess of the buttocks of a man who was very ill with an upper abdominal complaint that was diagnosed and later proved to be the result of a ruptured gallbladder. Whether or not this was the primary source of the infection with gas bacilli cannot be proved, although it must be presumed that the probability is that the infection entered the blood stream from the gastro-intestinal tract in some way and thus reached its destination. The abscess in the other case appeared in the thigh of a man who did not have any history of gastro-intestinal disturbance. It had apparently been present for some time, at least, symptoms had been noted for about two months. When the abscess in this case was opened, a mixed culture was found, but the presence of the gas bacillus was clearly demonstrated bacteriologically. These two cases illustrate the possibility of the occurrence of metastatic abscesses which must have been implanted by infection of the blood stream and yet septicaemia did not develop. No definite primary source could be established. In this connection, the fact should be pointed out that Thorsness² found *Clostridium welchii* in five of seventy-five gallbladders which were cultured after surgical removal for cholecystitis. The organisms were of low virulence and spores were not demonstrated.

Finally, the series includes at least two cases in which recovery followed infection of the blood stream, which had been demonstrated by positive blood cultures of *Clostridium welchii*.

One of these patients was a man, aged twenty-three years, who suffered a compound comminuted fracture of the left elbow thirty-six hours before admission to the Clinic. There was also a compound fracture of both bones of the left forearm and a fracture of the middle portion of the shaft of the humerus. Tetanus antitoxin or gas-gangrene antitoxin had not been given. At the time of the patient's admission to the Clinic, his pulse rate was about 130 beats per minute, his temperature, 103 degrees. Cultures were taken from the blood as well as from the wound. Roentgenograms disclosed gas in the wound, and this finding was borne out by inspection of the wound. Multiple incisions were made, the arm was not amputated because the muscles appeared to be in good condition. One therapeutic dose of polyvalent antitoxin was given intravenously, then, in five hours, another dose intramuscularly. The patient rallied from an almost moribund state and in twelve hours was conscious. His pulse rate dropped to 90 beats per minute and his temperature to about 99 degrees. The arm went on to a fully developed gangrene below the site of the fracture in the humerus and was amputated after about forty-eight hours. The patient made an uneventful recovery.

Thus it will be seen that these organisms may produce not only the local changes, due to their activity, but metastatic abscesses as well, and in some cases infection of the blood stream also. Without the extensive use of bacteriological cultures, accurate figures as to the incidence of infections of the blood stream and metastatic infections are almost impossible.

DIAGNOSIS

The diagnosis of gas infections must depend, therefore, not only on one's ability to judge clinical findings, but on the laboratory aids as well. If one were to tabulate, in the order of their importance, these diagnostic aids, they would be as follows: (1) pain, which is the most common symptom, (2) swelling, which is the most common sign, (3) elevation of the pulse rate, (4) bacteriological findings,—that is, smears from the wound, cultures from the wound, and cultures of the blood, (5) discoloration, (6) the presence of crepitus in the tissues or of gas in the exudate (not constant), (7) a bad odor, which is said to be characteristic, but which again is not a constant sign, (8) elevation of temperature, which at times, however, is not important, and (9) the presence of gas bubbles in the roentgenogram of the affected part.

Nearly all who have written on this subject agree that pain of severe degree is probably the earliest, if not the most common, symptom found in cases of gas infection or gas gangrene. Accompanying this pain is swelling, which is usually of a firm type, without much fluctuation, until necrosis is well established. Probably one of the most significant of the early signs is elevation of the pulse rate. While this is, of course, not diagnostic of gas infections alone, yet it is one of the earliest and most definite signs of a change in the patient's condition. As a rule, elevation of the pulse rate is out of proportion to the elevation of temperature. When this is observed to be the case, some infection should be suspected, and a smear and culture of the wound should be taken. If the smear shows organisms of suspicious appearance to one familiar with the examination of such smears, the author feels that institution of treatment by administration of gas-gangrene antitoxin is justified. The report of the culture will necessarily be delayed and one should not wait to receive it before commencing treatment when gas infection is suspected.

Discoloration of the skin is at first reddish, it later becomes grayish-yellow, and finally, cyanotic. Crepitus is one of the signs looked for most frequently and considered so characteristic. It is characteristic of gas infections, but may not be present in all anaerobic infections, as it has already been pointed out that some of them are not gas producing and yet are as pathogenic. Bubbles of gas in the exudate or pus are usually looked for and, in most instances, are found, but again it should be emphasized that, in spite of the name "gas gangrene", there are allied conditions just as pathogenic which do not produce gas.

The odor is said to be characteristic, it is interesting to read the various attempts to describe it. One author says the odor is "that of rotting meat", another declares "It smells something like a mouse", a third states "The odor is putrefactive, offensive, almost indescribable, but once encountered will never be forgotten", and still another characterizes it as "mousy". It is obvious that an attempt to describe the odor so that any one can recognize it is out of the question. From what has already been said, it must be clear that in some cases the odor may not be so characteris-

tic and he who diagnoses the condition on odor alone may come to grief

Elevation of temperature, as has already been pointed out, is not in proportion to the elevation of the pulse rate, in the case of infection by *Vibrio septique*, the temperature was elevated one day only and throughout the rest of the fatal course of one week remained normal or subnormal

The presence of gas bubbles in the roentgenogram of the affected part is regarded by some as of great value in diagnosis This may no doubt be

TABLE III

MORTALITY IN CASES OF GAS GANGRENE ENCOUNTERED IN CIVIL PRACTICE BASED ON THE FIGURES OF MILLAR³

End Result	No of Cases
Recovery (48.0 per cent)	291
Death (47.2 per cent)	287
Known outcome	578
Unknown (4.8 per cent)	29
Total	607

regarded as a valuable aid in diagnosis, but it cannot be pathognomonic. All bubbles are often seen in the roentgenograms of cases of compound fractures, as well as in those of cases of interstitial emphysema. Unless roentgenograms are taken repeatedly and an increase in the number or size of the gas bubbles can be demonstrated, the observation cannot be said to carry much weight in making the diagnosis as far as traumatic lesions are concerned.

In reviewing the literature on gas gangrene in civil practice, the available statistics, while small, seem to compare favorably with those at The Mayo Clinic, both as to incidence and types of infection. Millar³ has reviewed the greatest number of cases (607) and has presented a comprehensive summary of them. Table III is based on his figures. He stated that, according to the Surgeon General's office, the death rate for the American Expeditionary Force in France was 48.52 per cent in cases of gas infection. Of 128,765 wounds of the soft parts, gas gangrene developed in 1,389, or 1.08 per cent, and there were 674 deaths. In 25,272 cases which included fractures, gas gangrene developed in 1,329 cases, or about 5 per cent.

Boland⁴ reported a series of cases from the Grady Hospital in Atlanta. Stone and Holsinger⁵ reported sixty-seven cases from the University of Virginia Hospital in a twelve-year period, the mortality in this series was 32.4 per cent. However, in those cases in which an adequate dose of antitoxin was given as part of the treatment, a mortality of only 15.3 per cent was noted.

Larson and Pulford⁶, in an excellent review of the subject, reported a death rate of only 13 per cent in a series of seven cases. Other smaller groups of cases have been presented. The later writers all deal with the importance of the use of gas-gangrene antitoxin in such cases. The consensus of opinion is that antitoxin is of value in the treatment of the infection if administered as soon as the infection is recognized, and the earlier it is used the better. As yet, the statistics are far from sufficient to permit us to base any great claims on them, but the remarkable similarity between the figures presented by the various writers and those obtained at The Mayo Clinic indicates a step toward improvement in the treatment of this condition.

TREATMENT

The treatment may be divided into four phases, as follows: (1) recognition, (2) serum therapy, (3) surgery, and (4) dressings. Recognition of the condition is, of course, not part of the treatment, but it is so essential to the correct treatment that for the sake of emphasis it is included here. With the present knowledge and methods of treatment, once the diagnosis is established the chances of recovery are certainly greater than they were at the time of the War.

As to the actual treatment, once the diagnosis is established, the author believes that the first thing is to give gas-gangrene antitoxin in therapeutic doses. The preferable antitoxin is one of the polyvalent types now prepared. Most of these antitoxins are made to be effective against *Clostridium welchii*, *Clostridium oedematis maligni*, *Clostridium oedematiens*, *Clostridium histolyticum*, and *Clostridium sporogenes*. Some variation is found in strength and amount of antitoxin and in the individual antitoxins. The intravenous method of administration is the most effective for reaching the affected tissues. Some reaction may be observed, following the intravenous use of this antitoxin, but, when it is administered with some saline solution the effect of the reaction may be reduced. At the Clinic no serious results from these reactions have been observed, but they may be at times quite violent.

In our series, an average of two doses was given in each case, and, in many instances, the intravenous dose was followed in a few hours by an intramuscular dose. It is questionable how many doses are necessary, it is the author's impression that those patients who reacted favorably to antitoxin did so after one dose was given. In the case of septicæmia from *Clostridium welchii* previously noted, it seems that there is no doubt as to the value of antitoxin, as the patient had a positive blood culture before antitoxin was given and was practically moribund, whereas after antitoxin was given the blood culture was negative and the condition of the patient rapidly returned to normal.

No less important than the use of antitoxin is the use of the proper surgical procedures. The state of progress has not yet been reached where these patients can be cured by antitoxin alone, and one must not expect it

Surgical judgment and execution must play a very important part in the treatment. In cases of severe compound fractures or infections of soft parts, the decision as to amputation must be made. If the extent of the infection is such as to leave doubt that the limb can be saved, it must be amputated at once. However, in cases of localized infection, without extensive involvement, many a limb can be saved. Débridement will usually be necessary, and, in doing such débridement, dead tissue should all be excised. Three factors should be considered in deciding whether or not muscle is viable: (1) if it is red, it may be viable, (2) if it contracts when pinched, it is usually viable, and (3) if it bleeds freely, it probably is viable. Abscesses should be drained as they appear, and thorough drainage must be established. When wide-spread areas of infection are found, multiple incisions must be made, and an entire muscle may be excised in an effort to stop the progress of the infection.

Much diversity of opinion exists as to the relative value of various types of dressings. Those usually advised are potassium-permanganate packs, Dakin's solution, and hydrogen peroxide. It probably makes little difference which is used as long as the wounds are not packed tightly. The looser the bandage, the better. If possible, an should be allowed to reach the wounds for at least a part of the day. Amputations in severe cases should be of the guillotine type, so that there may be no danger of closing in flaps containing the organisms. The use of oxygen has been recommended, even to injecting it around the wound, such use, however, is deprecated as dangerous.

RESULTS

The results in this series of thirty-three cases are shown in Tables II, IV, and V. The findings indicate a mortality of 42.5 per cent (Table II). This is somewhat below the percentage in the World War. However, in Table IV, the cases are presented in a manner to show the value of gas-gangrene antitoxin. Excluding the group of patients with abdominal involvement, most of whom were hopelessly ill and in four of whom the con-

TABLE IV
CASES OF GAS GANGRENE AND INFECTIONS WITH GAS BACILLI (*CLOSTRIDIUM WELCHII*)
ENCOUNTERED IN FIVE-YEAR PERIOD

End Results	No. of Cases	Per Cent
Condition recognized and antitoxin given		
Recovered	13	76.4
Died	4	23.6
Condition recognized and antitoxin not given		
Recovered	6	54.5
Died	5	45.5
Condition not recognized and antitoxin not given		
Recovered	0	0
Died	5	100

dition was not diagnosed as such but was recognized at necropsy, the percentage of those who recovered following the use of the antitoxin is high (Table V). Others have reported similar results with the use of antitoxin. In general it may be said that, with recognition of the condition and a judicious combination of the use of antitoxin and surgery, a mortality of approximately 15 per cent may be expected.

TABLE V

CASES OF GAS GANGRENE AND INFECTIONS WITH GAS BACILLI (*CLOSTRIDIUM WELCHII*)
ENCOUNTERED IN FIVE-YEAR PERIOD

End Results (Excluding Abdominal Cases)	Per Cent
Antitoxin given	
Recovered	86.6
Died	13.4
Antitoxin not given	
Recovered	55.5
Died	44.5

As far as the prophylactic use of the antitoxin is concerned, there is little opportunity to give any significant figures as yet. In the present series, one patient had only prophylactic doses of antitoxin, and it was felt that the infection was much mitigated by use of the antitoxin. The author feels that the only way in which we can arrive at any definite conclusions in this regard is to wait until a large enough series of patients who have had prophylactic doses of antitoxin has been studied to permit a satisfactory comparison with a large series of patients who have not been given prophylactic doses of antitoxin.

CONCLUSIONS

1. Gas gangrene and gas infections must be diagnosed early if good results are to be obtained.
2. The multiplicity of anaerobic organisms, with variation in the clinical picture, must be remembered.
3. With the judicious use of polyvalent gas-gangrene antitoxin and surgery, the mortality in such cases should be reduced to approximately 15 per cent.

REFERENCES

1. WEINBERG, M., ET SEGUIN, P. La gangrène gazeuse. Bactériologie, reproduction expérimentale, sérothérapie. Paris, Masson & Co., 1918.
2. THORSNESS, E. T. Bacteriology of Cholecystitis. The Virulence and Spore Formation of *Clostridium Welchii*. Surg Gynec Obstet, LIX, 752, 1934.
3. MILLAR, W. M. Gas Gangrene in Civil Life. Surg Gynec Obstet, LIV, 232, 1932.
4. BOLAND, F. K. Gas Gangrene in Compound Fractures. Ann Surg, XC, 603, 1929.
5. STONE, C. S., JR., AND HOLSINGER, H. B. The Diagnosis and Treatment of Gas Bacillus Infection. Virginia Med Month, LXI, 200, 1934.
6. LARSON, E. E., AND PULFORD, D. S. Gas Gangrene of the Extremities. With Especial Reference to Trivalent Anaerobic Serotherapy. J. Am. Med. Assn., XCIV, 612, 1930.

SEMILUNAR CARTILAGES OF THE KNEE *

THE "JUMP SIGN"

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In about one-fifth of the cases of derangement of the semilunar cartilages, the examiner will obtain, in addition to the so called "socket sign" or "box sign", a jump or movement easily recognized by the hand, which is occasioned by the sliding of the tibia under the femoral condyles

This phenomenon was first observed by the author in 1928 and, in July 1930, he published a paper¹ in which were reported the cases of twenty-three patients who presented the sign and who were operated upon. Since that date, further observations of this phenomenon have been made and the present paper is based on a study of seventy-five patients who presented this sign and who were operated upon in Rawson Hospital

To obtain the "jump sign", one proceeds in the same manner as when investigating the socket or box sign, except that the pull on the leg must be held a little longer and must be done with greater force, so as to compel the meniscus to pass under the femoral condyle, and, when the examining table allows the sliding of the patient's buttocks, the foot of the table must be raised. The patient lies supine and well relaxed, with the normal leg hanging over the side of the examining table and the forearms crossed over the chest. The knee to be investigated is held in flexion of 130 to 140 degrees. The surgeon, standing at the opposite side of the table from the leg to be examined, holds the calf of the leg just under the popliteal space with both hands, keeping one elbow over the dorsum of the foot. The surgeon then pulls the leg toward himself, as in looking for the box sign. If the box sign is present, the tibia slides under the femoral condyles, if the jump sign is positive, the head of the tibia, sliding under the femoral condyles, produces a little jump or jerk, which is easily perceived by the hand. (See Figure 1)

When the traction is released, the original position of the knee is restored, but with no evidence of sudden movement or jump. At the time when the jump sign is elicited, the patient is conscious of some movement in the knee and occasionally of some sudden pain. Sometimes there may be observed at this time a slight muscular quivering or spasm, particularly posteriorly, accompanied by a clear snap. The author wishes to emphasize the fact that the jump sign is mainly tactile, only occasionally is it audible or visible. The prominence or strength of the jump sign is not always constant, but may change from one examination to another, sometimes it is impossible to obtain it on a second examination.

* From the Surgical Clinic, Rawson Hospital, Buenos Aires, Prof. Dr. Enrique Finochietto, Director

The convex border of the internal semilunar cartilage is firmly attached to the joint capsule, but has a certain amount of mobility, while the anterior and posterior horns, inserted near the tibial spine, are absolutely fixed. When the knee is being tested for the box sign, the posterior half of the meniscus, released by its spinal insertion, begins to present under the internal femoral condyle. If the posterior part of the semilunar cartilage is normal, nothing occurs, but, if the posterior part is damaged (detached, bruised, or bipartite) so that the mobility is increased, it will then slip under the condyle and suddenly move anterior to its point of contact with the tibial articular surface. Naturally, any condition which exaggerates the mobility of the knee—such as abnormally lax crucial ligaments—predisposes to an increase of the jumping of the semilunar cartilage.

The reports in the literature, particularly those of Fisher², Jones³, and Hey Groves⁴, make one sure that these men were dealing with the condition called "spring knee" rather

than with knees presenting the jump sign. Many times the author has observed the sign which these men have reported and has called it the "self jerk." Frequently this jerk can be produced by the patient himself, whereas it is difficult or impossible for the examiner to elicit this sign. The jump sign has not been observed in those knees which have presented this so called "self jerk." Neither has the writer found any evidence of a relationship between the "spring knee" and the jump sign.

There is nothing special about the original trauma which would suggest the probable occurrence of the jump sign. The trauma is usually severe, as is generally the case when the crucial ligaments are damaged. Recurrences are common. The sign is most frequently noted in patients who engage in sports. Usually the patient presents this sign when first seen, and the sign persists even after a long period. Abnormal lateral passive movements are often observed, but there is nothing particularly distinctive about them or about the effusion, pain, etc.

At the time of the first observation of the jump sign, it was thought

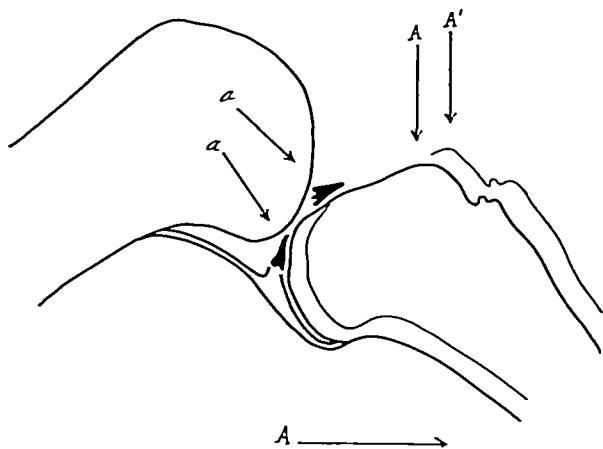


FIG 1

Drawing showing the difference in mechanism between the box sign and the jump sign. In a knee presenting the box sign, the tibia slides in the direction of the arrow, *A*, and moves from *A'* to *A*. If the jump sign is present, the posterior part of the internal semilunar cartilage moves under the condyle from *a* to *a'*.

that this sign was produced by the sliding of a portion of the semilunar cartilage between the articular surfaces of the tibia and the condyle, that this wandering portion was adjacent to the posterior horn, and that the anterior crucial ligament was seriously damaged, either torn or stretched.

Later, however, as the same pathology was found in each case at operation, this sign seemed to be worthy of further attention and it was thought that possibly it might be pathognomonic of some particular condition. Recent experience prompts the author to state that this jump sign is not one of the numerous symptoms produced by a pathological condition of the semilunar cartilages, but it indicates that the posterior portion of the internal semilunar cartilage is injured, and that this portion moves between the tibia and the internal condyle. It may be inferred that the anterior crucial ligament is relaxed.

In several cases, the author has observed in the external meniscus the same posterior or complete lesions that were found in the internal semilunar cartilages which produced the jump sign. These injuries are quite frequently accompanied by relaxation or tear of the anterior crucial ligaments, but, in spite of this, the jump sign is not elicited in such cases.

In a number of cases, this sign has been of aid in distinguishing be-

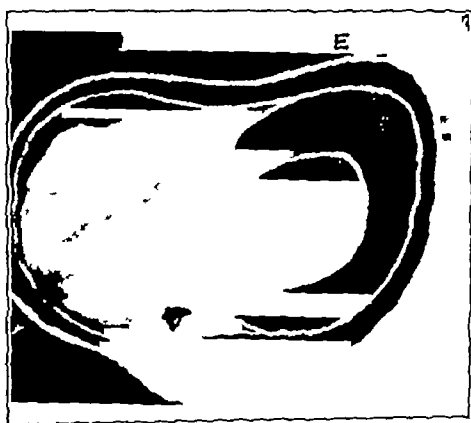


FIG 2

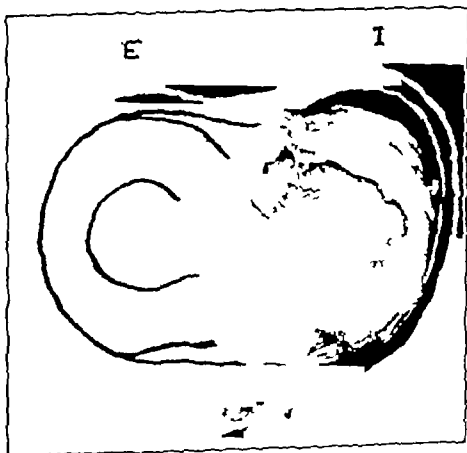


FIG 3

tween an injury to the internal and to the external semilunar cartilages, and has spared the patients the external incisions which were suggested by the clinical signs. In one instance, the lesion was apparently confined to the anterior horn, and, had the operation been carried out in the classical manner, only the anterior half of the meniscus would have been removed. However, the existence of the jump sign suggested further investigation and the semilunar cartilage was removed *in toto*, whereupon it was found that the more important injury was to the posterior portion behind the internal lateral ligament. In six cases, exploration by the usual method did not show any apparent injury to the cartilage, but, since the jump sign had been observed before the operation, the entire meniscus was removed and the injury to the posterior portion was found.

The seventy-five cases in which this sign was present and in which operations were performed represent 17.5

per cent of the 428 meniscus operations performed after this sign was first observed. In a series of 163 operations, the sign occurred in 17.1 per cent of the cases; it was also found in nine patients who were not operated upon. In another series of 231 patients, the sign was present in 16 per cent.

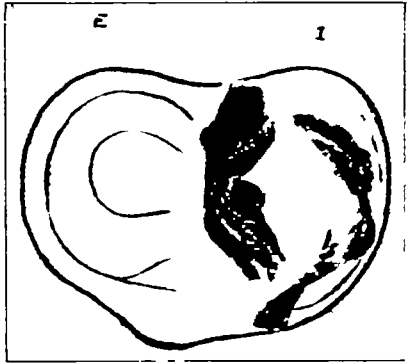


Fig 4



Fig 5

Of the seventy-five cases, there was only one in which no injury could be found in the posterior portion of the meniscus. In forty-two cases, the injury was posterior to the internal lateral ligament. In twenty-one cases showing posterior lesions, there was also damage to the portion anterior to the ligament, and in eleven cases the tear of the meniscus was complete. Whenever the jump sign is obtained, although no damage can be seen on inspection of the semilunar cartilage, it is always wise to explore the posterior half.

Of the forty-two cases in which the lesion was confined to the posterior portion, one showed laxity of the posterior semilunar capsular attachment, with two synovial fringes, and, consequently, the meniscus was movable and was able to pass under the condyle. There were fifteen cases of detachment of the cartilage from the joint capsule, the length of the detachment varying from twelve millimeters to sixty millimeters. In each case, this detachment began at the posterior portion of the cartilage. Therefore, in sixteen cases out of seventy-four, the meniscus itself was intact and the pathology was found only in its capsular attachment.

In twenty-six cases, the posterior part of the semilunar cartilage was damaged by simple bruising (Fig 2) or by bruising accompanied by capsular detachment of the crushed portion.

A longitudinal bipartition of the posterior portion (Fig 3) was found in most of the cases. It should be borne in mind that the capsular portion of the bipartite cartilage can be detached from the capsule, for, if at operation the convex portion is left, it may pass between the condyle and the tibia, causing a recurrence of symptoms.

In twenty-one cases, although the posterior part of the cartilage was the site of the lesion, the portion anterior to the internal lateral ligament was also somewhat damaged and the pathology was evident upon opening the joint.

In eleven cases, the semilunar cartilage was completely torn, from the anterior portion to the posterior portion (Figs 4 and 5)

The fact should be emphasized that, in spite of the presence of an anterior lesion, if the jump sign is found, not the anterior portion alone should be removed, but the entire cartilage should be extirpated

As has been stated, there was but one case in which a posterior lesion was not discovered. At operation, the anterior horn was found to be torn (Fig 6) and the meniscus was loose. The anterior crucial ligament was intact and the surgeon was unable to find any posterior detachment, fissure, or bipartition. This may have been a case of incomplete exploration,

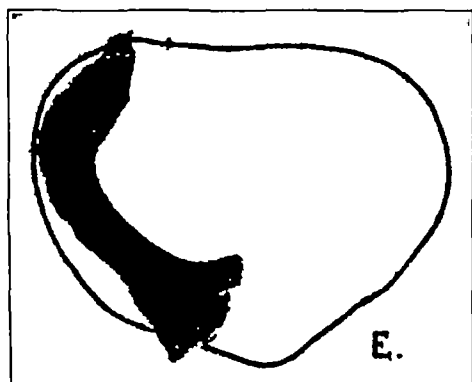


FIG 6

as exploration is sometimes difficult when the anterior crucial ligament is not stretched

In the author's series, lesions of both semilunar cartilages occurred in 10 per cent of the cases, but, in the knees which presented the jump sign, the external semilunar cartilage, as well as the internal semilunar cartilage, was found to have been injured in 20 per cent of the cases. Although at times a posterior lesion of the external semilunar cartilage, with

partial or complete tear of the anterior crucial ligament, was discovered, in none of these cases was the jump sign present. Because of its anatomy, the external semilunar cartilage cannot produce the jump sign, it produces, instead, a springing or snapping of the knee.

In seventy-one of the seventy-five cases presenting the jump sign, the condition of the anterior crucial ligament was correctly diagnosed before operation, in fifty-seven cases, or 80 per cent, this ligament was damaged.

In a series of 163 cases in which operations were performed, eighty-seven showed injury to the anterior crucial ligament. In the knees which presented the jump sign, the anterior crucial ligaments were injured in 30 per cent more cases than in knees which did not show this sign. Of the fifty-seven cases in which the ligament was damaged, it was only partially torn in twenty-five, in the remaining thirty-two cases, the rupture was complete. In only three cases was the hypertrophic intercondylar synovitis sufficiently marked to prevent an effective exploration.

Although it was at first thought that a lesion of the anterior crucial ligament was necessary to produce the jump sign, further experience has shown that this is not necessary. Lesions of other parts of the joint—effusion, hypertrophic synovitis, femoral detachment of the ligamentum mucosum, arthritis deformans, etc.—are in no way related to the presence of the jump sign.

TREATMENT

Every knee presenting the jump sign should be explored and the whole internal semilunar cartilage removed. A knee presenting the jump sign possesses a wandering posterior portion of the semilunar cartilage which should be extirpated on account of the certainty of recurrent attacks and also because of the injury which a constantly moving portion of cartilage between the condyle and tibia may produce in the diarthrodial cartilages. The entire removal of the meniscus is of the utmost importance, since the posterior portion is usually the part which is most markedly injured.

The discovery of damage to the posterior cartilages has been facilitated by the use of the hook, devised by the English surgeons. When wisely handled, this hook demonstrates clearly those changes within the joint which otherwise might remain undetected. In an earlier paper, the author emphasized the use of the blunt hook, which he felt had been of great aid in those cases in which the injury to the meniscus was associated with injury to the crucial ligaments, the ligamentum mucosum, and the diarthrodial cartilages.

SUMMARY

The jump sign is a jerk produced during the passive movement of the head of the tibia under the femoral condyle.

The jump sign is elicited by the passing of the damaged cartilage between the condyle and the tibia.

The most evident pathology of knees demonstrating this sign is the injury to the posterior half of the internal semilunar cartilage, any other intracapsular lesions are accessory.

Knees showing the jump sign and those in which there is a snapping or clicking, or spring knees, should be definitely differentiated.

Knees presenting the jump sign should always be operated upon and the entire semilunar cartilage removed. If this is not done, relapses and arthritis will follow.

REFERENCES

- 1 FINOCHIETTO, RICARDO. Meniscos de la rodilla. El signo del salto. *Prensa Méd Argentina*, XVII, 302, 1930.
- 2 FISHER, A. G. TIMBRELL. *Internal Derangements of the Knee-Joint*. London, H. K. Lewis & Co. Ltd., 1924.
- 3 JONES, SIR ROBERT. Footnote in *Internal Derangements of the Knee-Joint*, by A. G. Timbrell Fisher, page 42. London, H. K. Lewis & Co., Ltd., 1924.
- 4 GROVES, ERNEST W. HEY. *The Crucial Ligaments of the Knee-Joint. Their Function, Rupture, and the Operative Treatment of the Same*. *British J. Surg.*, VII, 50S, 1919-1920.

FURTHER OBSERVATIONS ON THE FRACTURED DISTAL RADIAL EPIPHYSIS

BY ALEXANDER P AITKEN, M D , BOSTON, MASSACHUSETTS

A few months ago, the author¹ reported on the end results of sixty cases of fractured distal radial epiphysis, followed from two to nine years at the Boston City Hospital. Two of the conclusions drawn from this study may be mentioned here. First, regardless of the amount of displacement, the epiphysis returned to normal position within a period of from two to three years. This occurred in all of the thirty-four cases discharged from the hospital with displacement. This fact, in the opinion of the author, obviates the necessity of repeated manipulations and eliminates the use of osteotomy for correction. Second, although deformities following such injuries are seen at times in the larger hospitals, the actual occurrence of deformity is relatively rare in proportion to the total number of injuries. These deformities are due to crushing injuries to the epiphysis and are in no way attributable to malposition.

Since the publication of this previous report, further cases have been studied, as follows,—one patient injured in 1931, another in 1933, and eighteen in 1934. The first of these patients presents the only deformity in the entire group of eighty cases, this case will be discussed later.



FIG 1-A

J. N., aged fifteen
Left wrist on admission
No attempt at reduction
was made



Left

FIG 1-B

Right

J. N. X-rays taken eight months later, showing reduction of the fractured epiphysis. Note loss of volar curve, but marked increase in dorsal curve. (See Figure 3, D.) Ossification is complete in the ulnar halves of both radii.



FIG 2-A

J S, aged nine. Left wrist on discharge, after two attempts at reduction



FIG 2-B

J S X-ray taken five months later. The epiphysis has again resumed its normal relationship to the shaft. Note loss of volar curve and the dorsal curve of shaft (See Figure 3, A)



FIG 2-C

J S X-ray taken fourteen months after injury. Note that the upward curve of the dorsum is less marked, early evidence of reestablishment of the volar curve

Of the eighteen patients injured in 1934, three were females and fifteen were males. The ages varied from seven to eighteen years. All of the patients showed fracture of the posterior edge of the diaphysis with fracture either of the styloid or ulnar shaft. One manipulation was performed in nine cases. In five cases two manipulations were necessary. Four attempts at reduction were made in one case and five in another. One patient, admitted three weeks after injury, was osteotomized. In another patient, injured seven weeks previous to admission, no attempt was made at correction. In these two patients displacement amounted to one-half the thickness of the shaft (See Figure 1-A). The position on discharge was classified as good in four cases, fair in eight cases, and poor in six cases.

In one of the most recent text-books on fractures, the authors state that anatomical reduction is necessary to prevent deformity. Similar statements can be found in most of the modern text-books. That this teaching is based on fancy rather than fact is well illustrated in our former report and corroborated in this series. Although fourteen of the eighteen patients injured in 1934 were discharged with displacement, none of them show any displacement whatsoever seven to sixteen months later.

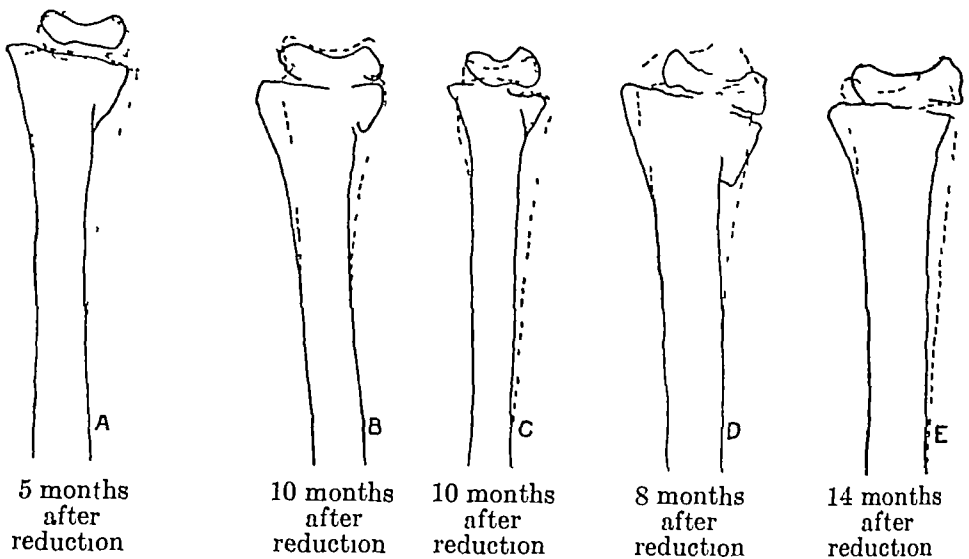


FIG 3

Superimposed tracings of x-rays in five different cases taken on discharge and at present time. Black lines indicate position on discharge, dotted lines show present position. Note that the fracture of the epiphysis is not actually reduced, but is brought into line by the absorption of the volar portion of the shaft and the production of bone on the dorsum of the shaft. This new bone is formed by the periosteum which was stripped up at the time of injury. The "reduction" is then not a true one, but, rather, a swinging upward of the shaft to meet the epiphysis. Eventually the volar curve becomes reestablished.

In the two cases in which the displacement amounted to one-half the thickness of the shaft, complete reduction has occurred within eight months in one case and five months in the other (Figs 1-B and 2-B). The case illustrated by Figures 1-A and 1-B is most interesting, as the boy was in the upper age group. Not only has reduction occurred, but normal ossification of the ulnar half of both radial epiphyses has also taken place. There is shortening of three-eighths of an inch, however, but this cannot be determined clinically, as the ulna on the same side is one quarter of an inch short.

The manner in which nature accomplishes this reduction is clearly demonstrated in this series. As previously described the evidence offered indicates that reduction is accomplished by the absorption of the volar portion of the shaft and the production of callus on the dorsum by the intact periosteum. In this manner, the shaft is swung up to the epiphysis. When this has been done, the normal volar bowing becomes reestablished. In eight of the cases, the volar bowing was either markedly diminished or absent, due to this absorption, while the dorsum of the shaft definitely swung up to the upper edge of the displaced epiphysis. (See Figures 1-B, 2-B, and 3.) In none of the cases of two or more years' duration was any such marked loss of the volar curve noticed. Apparently then, although the epiphysis is brought into alignment with the shaft within a few months, at least two years is required to reestablish the volar bowing. It may be stated here that the loss of this curve can be determined only by x-ray and is of no clinical importance.

Retardation of growth, averaging from one-sixteenth to three-eighths

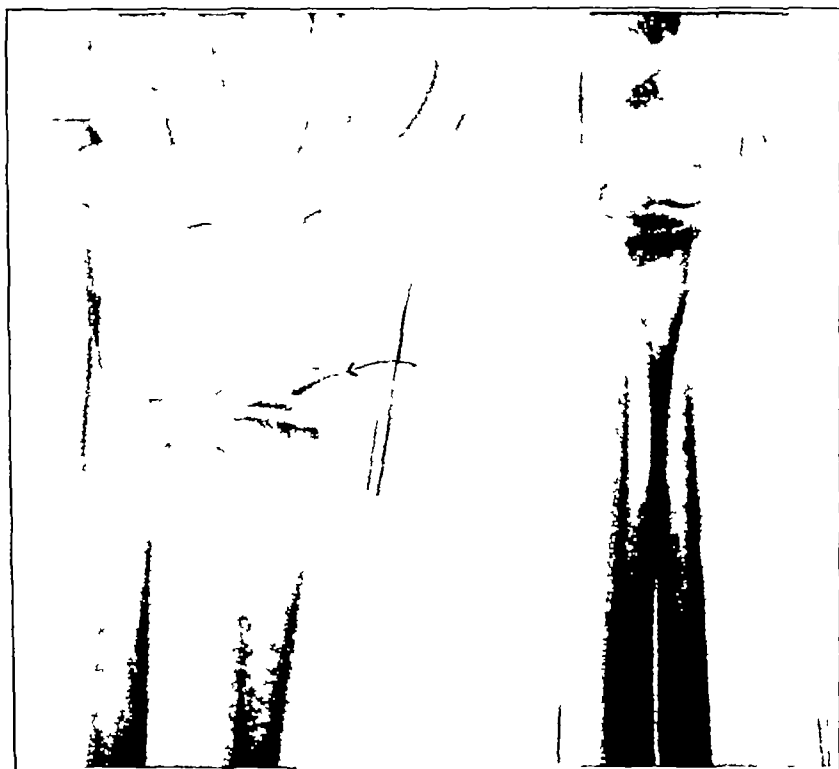


FIG 4-A

F J, aged nine. X-rays taken in 1931. Note fracture of the bony portion of the epiphysis and the slight displacement.

of an inch, occurred in twelve of the eighteen cases. In no case could shortening be determined clinically. This percentage of retardation is high in comparison with the older series in which it occurred in twelve of the sixty cases. It is probably true, therefore, that most cases will show some temporary shortening, but by the time ossification is complete few cases will show permanent loss in length. The all-important factor in the prevention of retardation of growth is the amount of trauma done the growing cartilage at the time of injury. This factor can neither be diagnosed by x-ray nor controlled by treatment.

As the average age of ossification is fifteen years for the female and seventeen for the male, the question has been raised whether, in the cases of older patients in whom displacements have occurred near the normal ossification time, the displacement would be reduced before this ossification was complete. In the present series there were five patients ranging in age from fourteen to eighteen years. In them, not only has reduction occurred, but ossification has been complete or nearly so within nine months of the date of injury. In the older series, there were five patients with displacements—three, sixteen years of age, and two, eighteen years of age—who, two years later, showed no evidence of their injuries. The



FIG 4-B

F J X-rays taken four years later. Note that the ossification is nearly complete in the radius, while the ulnar epiphysis has not yet begun to ossify. Also note the relative position of the radial and ulnar styloids.

proximity of the patient's age at the time of injury to the normal ossification time, therefore, presents no problem.

In this type of injury, it is assumed that the fracture line does not cross the growing cartilage, but runs just proximal to it. The entire epiphysis and the fragment of the shaft are thus displaced *en masse*. In three of the recent cases (two cases of fracture of the radial epiphysis and one of fracture of the distal tibial epiphysis), definite fracture lines crossed the epiphysis and entered the joint. One of the radial epiphyses thus fractured presented the only case of deformity (Figs 4-A and 4-B). There was but slight displacement and no attempt was made at reduction. The radial half of the bony epiphysis was definitely crushed. Ossification is now complete at this point within four years of the date of injury. No deformity occurred in the other two cases. Although there were but three such cases in the series, it does seem that deformity is more liable to develop in those cases in which the fracture line involves the growing cartilage.

In conclusion, the author wishes to state that an attempt should be made to reduce all displacements. He does not believe, however, that repeated manipulations or osteotomy are warranted.

CONCLUSIONS

1 Displacement of the epiphysis does not persist. All displacements are reduced well within a year (five to eight months).

2 Reduction is accomplished by the production of bone on the dorsum of the shaft, so that the shaft is brought up to the epiphysis. The volar portion of the shaft undergoes absorption. This loss of the volar bowing is restored within two years.

3 Temporary retardation is commonly noticed, but is of no clinical importance.

4 Reduction occurs at any age, regardless of the proximity to the normal ossification time.

5 The one case of deformity in the series is attributed to crushing of the epiphysis, which is demonstrable by x-ray.

- 1 AITKEN, ALEXANDER P. The End Results of the Fractured Distal Radial Epiphysis. *J. Bone and Joint Surg.*, XVII, 302, Apr. 1935.

FRACTURES OF THE FEMORAL NECK TREATED BY BLIND NAILING *

BY JOHN W O'MEARA, M D , WORCESTER, MASSACHUSETTS

In a period of somewhat more than a year, the author has treated fourteen fractures of the femoral neck by nailing blindly through a small lateral incision. The results are so much superior to those formerly obtained by splinting in plaster that the author feels the method should be given a trial by all surgeons competent to use it. The patient is more comfortable, mortality is lower, the period of hospitalization is reduced, the anatomical result is improved, and function is regained more rapidly. Johansson ^{1,2}, Wescott ³, and King ⁴ have published procedures having the same object. The technique previously described by the author ⁵ is simpler than any of these and is adequate.

This technique involves three essential variations from the common practice.

The first is the use of the lateral x-ray. It is hard to understand why this was not employed long ago. In 1916, Hickey ⁶ of Detroit showed that it could be done. Before proceeding with fixation, the writer now checks all reductions by lateral as well as anteroposterior roentgenograms. This should be done no matter what method of fixation is employed, if the method does not permit this, it should not be used. The knowledge gained from the lateral x-rays and from a more critical study of the anteroposterior views has convinced the author that full abduction, with extension and slight internal rotation, does not reduce all fractures of the femoral neck, and has led him to the method of reduction now used.

The technique of taking lateral x-rays requires no special equipment and is illustrated in Figure 1. The roentgen tube is placed so that the central ray crosses the femoral neck at a right angle. This ordinarily brings the tube under the well knee which is lifted forward out of the way. The film is on the outer side of the injured hip. At first it was thought necessary to tip the upper end of the cassette into the loin so that the film would be as nearly as possible parallel to the femoral neck, but this has since been found to be unnecessary. A satisfactory result is produced when the cassette is held against the outer side of the hip without tipping its upper end into the loin. Slight adduction of the thigh is helpful because it brings the neck into view below the upper margin of the acetabulum.

The second variation is in the method of reduction. In only a few of these fractures are the fragments impacted in good position. The common primary finding is marginal contact rather than actual engagement of the fragments. The fractured surface of the distal fragment faces forward, with its posterior edge in contact with the fractured surface of the

* Read at the Annual Meeting of the American Academy of Orthopaedic Surgeons, New York, N. Y., January 16, 1935.

capital fragment To correct this, a sheet is passed around the upper thigh and the fragments are pulled apart Others use adduction alone for this purpose, but the author is not sure that this method is adequate The fracture is reduced by the following manoeuvres pulling distally to obtain length, flexing the thigh and knee to a right angle, lifting the extremity strongly forward, internally rotating the leg, while maintaining extension, and extending it while maintaining internal rotation Abduction is not stressed The leg is then measured with a tape If measurement shows full length, x-rays are taken in two planes

The importance of obtaining a valgus position is stressed The author is convinced that "fixing the limb in an attitude of full abduction, extension, and slight inward rotation" does not produce this position in many instances The difference in position obtained by that manoeuvre and by the method here described is illustrated in Figures 2, 3, and 4

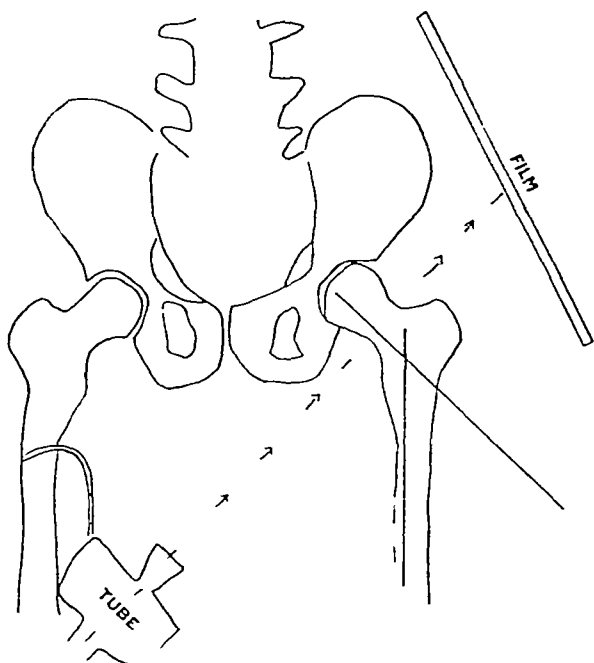


FIG 1

Method of taking lateral x-rays

The third variation is in the method of fixation The essential instrument is the Smith-Petersen⁸ three-flanged nail

After the fracture has been reduced and x-rayed, the x-rays are used to determine angles and measurements The angle between the neck and the shaft in the anteroposterior plane is measured with a protractor The protractor, set at this angle (usually from 130 to 135 degrees), is laid on the drapes above the hip to be used as a guide under which the nail will be inserted Measurement of the same roentgenogram determines the length of the nail, usually from three and one-half to four and one-half inches The other factor to be ascertained is the forward angle of the neck Others go into much detail to measure this accurately, using more or less complicated methods and equipment The author makes no effort to determine this angle in each case In working out his technique, x-rays of numerous normal hips in different degrees of rotation were made He then satisfied himself that when the thigh was internally rotated as far as possible without tipping the pelvis, the femoral neck was flattened and



Fig 2

Showing loose intracapsular fracture with upward displacement of the proximal fragment

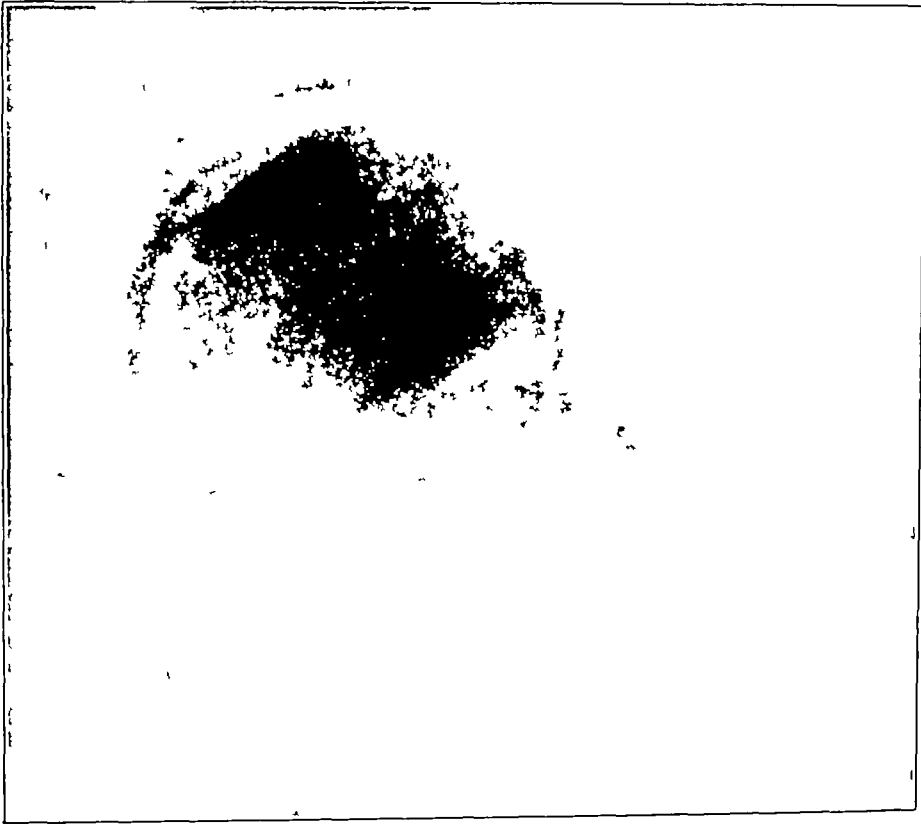


Fig 3

Same patient as in Fig 2, showing condition after the limb had been fixed in full abduction, extension, and slight inward rotation

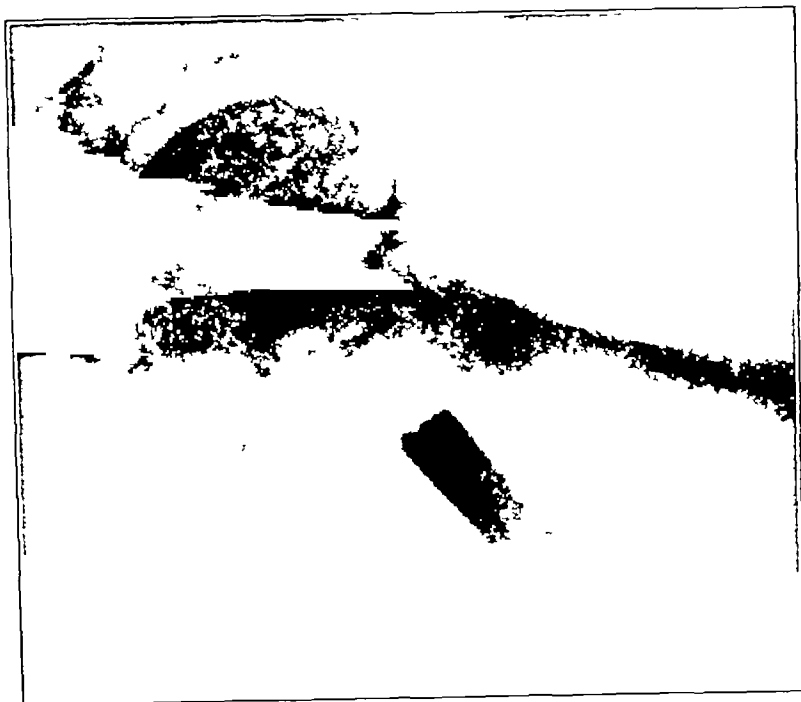


FIG 5

Same patient as in Figs 2, 3, and 4, showing nail driven in half-way



FIG 1

Same patient as in Figs 2 and 3, after second reduction by method described. Note approximately 20 degrees' improvement in angle, reducing shearing strain

parallel to the table on which the patient lay. Therefore, the thigh was internally rotated and the nail inserted parallel to the table. The writer believes it much more important to reduce the fracture precisely than to split the dead center of the head with the nail.

A short lateral incision is made and the nail is inserted about an inch below the junction of the trochanter and the shaft. The nail is then hammered in half-way (Fig 5) and its position is checked by anteroposterior and lateral x-rays. If the x-rays are satisfactory, the nail is driven home, the fracture is impacted, and the wound is closed.

The author has used this method in fourteen cases. Seven patients were operated upon a year or more ago. The average age was sixty-eight. The youngest patient was fifty-five, the oldest, seventy-seven. In the entire group there has been but one failure, and this case was badly chosen. The patient had had a spastic hemiplegia with paralysis of the right side for a year before the right hip was fractured. The fracture was well reduced and the nail correctly placed, but two months later shortening was noted and the x-ray showed that the nail was not holding and displacement was occurring. It was believed that the combined factors of bone softening from a year's disuse and spastic muscles had caused this. The nail has now been removed and bony union is not expected. Two patients have been back at work before they would have been out of spica plasters had they been treated by the abduction method.

CONCLUSIONS

Results in a group of fourteen fractures of the femoral neck, treated by accurately checked reduction and internal fixation, using the Smith-Petersen three-flanged nail and a small lateral incision, have been much more satisfactory than those obtained by other methods. The earlier recovery of function has been particularly pleasing.

REFERENCES

- 1 JOHANSSON, SVEN. Zur Technik der Osteosynthese der Fract. Coll. Femoris (Vollaufg. Mitteilung). *Zentralbl. f. Chir.*, LIX, 2019, 1932.
- 2 JOHANSSON, SVEN. Noch einmal zur Technik der Osteosynthese der Fract. Coll. Femoris. *Zentralbl. f. Chir.*, LX, 864, 1933.
- 3 WESCOTT, H. H. A Method for the Internal Fixation of Transcervical Fractures of the Femur. *J. Bone and Joint Surg.*, XVI, 372, Apr. 1934.
- 4 KING, THOMAS. Recent Intracapsular Fractures of the Neck of the Femur. A Critical Consideration of Their Treatment and a Description of a New Technique. *Med. J. Australia*, I, 5, 1934.
- 5 O'MEARA, J. W. Fractures of the Femoral Neck Treated by Blind Nailing. *New England J. Med.*, CCXII, 43, 1935.
- 6 HICKEY, P. M. The Value of the Lateral View of the Hip. *Am. J. Roentgenol.*, III, 308, 1916.
- 7 WHITMAN, ROYAL. Remarks Introductory to a Demonstration of the Abduction Treatment of Fracture of the Neck of the Femur. *J. Bone and Joint Surg.*, XII, 11, Jan. 1930.
- 8 SMITH-PETERSEN, M. N., CAVE, E. F., AND VANGORDER, G. W. Intracapsular Fractures of the Neck of the Femur. Treatment by Internal Fixation. *Arch. Surg.*, XXIII, 715, 1931.

THE TRAUMATIC ORIGIN OF ACCESSORY BONES AT THE ELBOW

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TRANSLATED FROM THE GERMAN BY W P BLOUNT, M D ,
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Since Pfitzner brought up the subject in 1892, accessory para-articular bones have been much discussed, particularly in the recent literature. The problem is not merely theoretical, but of great significance in industrial surgery.

The accessory bones may be divided into two groups. The first type is encountered most often near the carpal and tarsal joints and is regarded as a normal variation. These bones, which Pfitzner called "*sesam- und sesamoidknöchelchen*", have been thoroughly reviewed by anatomists and roentgenologists, and usually offer no great diagnostic difficulties. The second group includes rare bone structures at other joints. In the reported cases, the elbow joint is most frequently involved and the supernumerary bones are found in three typical locations: distal to the medial humeral epicondyle, proximal to the olecranon, and near the trochlear fossa. The question of traumatic or congenital origin is always raised. The recent studies of Feinberg, Ewald, Rostock, and Kremser lead one to agree with the theory of congenital anomaly. Even Kremser, however, admits that trauma may be the cause in isolated cases, although not in all. Is it possible that the same ossicle may occur at one time congenitally and again as the result of trauma? An examination of the following cases may assist in clarifying this question.

CASE REPORTS

CASE 1 E Z, female, aged twenty-seven, a factory worker, came to the Hospital for x-ray examination because of pain in the left elbow of three weeks' duration. She could remember no severe traumata, but admitted minor injuries. The joint was slightly swollen and movement somewhat painful. The x-ray showed slight bone atrophy with subperiosteal new-bone formation at the distal end of the humerus and the proximal ends of the radius and ulna. Five millimeters distal to the medial humeral epicondyle was an oval bone shadow, one centimeter by one and five-tenths centimeters, with well defined cortex and spongiosa. Reexamination after one month showed an increase in thickness and density of the subperiosteal new bone, but no change in the accessory bone (Fig. 1).

CASE 2 L M, male, aged twenty-seven, a factory worker. Since an injury to the right elbow several days before examination, flexion had been painful. He could not recall previous trauma. The x-ray showed no evidence of recent bone injury, but, distal to the medial condyle, was a round shadow, the size of a hazelnut, similar to that seen in Case 1. The author has five such cases in his files and an additional case has been placed at his disposal through the kindness of Dr. Golonska.

CASE 3* A male laborer, aged twenty, gave a history of trauma to one elbow. X-ray examination showed a supernumerary, isolated, elongated, sharply demarcated bone with a distinct *spongiosa* at the tip of the olecranon (Fig 2). X-ray diagnosis: *patella cubiti*. The writer has recently seen a similar case in consultation. In this case, however, there was no indication of recent trauma, but an *arthrosis deformans* existed.

In all of these cases we are certainly not dealing with a recent avulsion. The time interval is too short and the adjacent bone surfaces are too clean-cut and smooth. All writers agree on this point, but differ as to further considerations. The absence in the history of significant trauma,



FIG 1

Case 1. Accessory bone in the absence of a history of trauma.

the rounded contour, the normal bone structure, and the usually well preserved joint function have led several observers to designate the condition as a congenital anomaly.

The evidence is particularly strong when bilateral ossicles are encountered (Kohler, Ewald, Hartung, and Feinberg). Cases are rare in which the bone is removed for histological study. Hasselwander found no normal ossification in one case, but thought that the ossicles had their origin

in cartilage. Rostock and Crilovich stated that the extirpated bodies were covered with hyaline cartilage. Crilovich, Sudeck, Friedlander, and others thought that the accessory bones developed from small pieces of periosteum, freed by trauma, or from metaplasia of young connective tissue following injury. There are certainly numerous cases in which pieces of the periosteum have been separated from the bones by trauma. It is difficult, however, to conceive of the formation in this manner of such well rounded, sharply defined bones with characteristic structure as in the three cases reported. There is no history either of the necessary chronic causative factor, be it traumatic or inflammatory.

Now let us proceed to the theory that the bodies in question are the result of traumatic avulsion of the ossification center in early childhood. This is the cause of the round epicondylar bodies, according to Grashey,

* Published in detail by Melnikova and Odessky.

Köhler, and Wülfing, and of cubital patellae in the opinion of Kienböck, Katz, and Gunn. With this observation, the author entirely agrees. The avulsion of an apophyseal osseous center occurs quite frequently, even after slight trauma. The author has collected a number of x-rays of traumatically displaced epicondylar apophyses in children of different ages and these show the displaced fragments to be separated from the condyles by from a few millimeters up to one and one-half centimeters. Check-up x-rays after a few months show definite evidence of concentric growth of the fragments with gradual assumption of the rounded form.

CASE 4 A seven-year-old boy fell from a tree. The x-ray showed an avulsion of the medial humeral epicondyle. Figure 3 shows the case six months later. The position of the rounded body is identical with that seen in Figure 1. The function of the injured joint had by this time been recovered. All motions were free and painless so that the boy could play as usual. It is easy to understand how a grown person could entirely forget such a trauma, especially if it occurred in early childhood.

It is noteworthy that in the x-rays of the cases reported in this paper, as well as

in most of those from the literature, the surfaces of the medial epicondyle and the neighboring part of the humerus are smooth and show no definite evidence of trauma. This apparently normal configuration of the bone is advanced by the exponents of the congenital theory as evidence of the truth of their hypothesis. According to Pfizner's statement, a sesamoid bone can be diagnosed if none of the other parts of the bone is abnormal. This is not true, however, in the author's cases. On careful comparison of the affected side with the normal, there appears at once a difference in form. If the tracings of the two x-rays are superimposed, it is evident that the injured epicondyle is flatter and less well rounded than that of the normal, the distance from the corner of the trochlea is greater, and the distal and medial parts are missing. All of this applies equally well to the cubital patella. If the displaced fragment of bone and cartilage becomes still further separated by muscle pull while continuing to develop, one can readily see how this condition may result. The ossicle is imbedded in the



FIG 2

Case 3 Patella cubiti



FIG 3

Case 4 Traumatic avulsion of the medial humeral epicondyle

triceps tendon and the surface adjacent to the bone is covered with cartilage. The changes in size and form of the newly created bone are governed by the direction of muscle pull and active joint movement. Careful observation of both olecranons shows the variation from the normal on the injured side.

The bilateral occurrence of accessory bones is the most difficult to explain from the standpoint of the traumatic theory, but the symmetrical

appearance of fractures is not unusual. As is true of every institution with a large x-ray department, the Ostroumoff Hospital has had several such cases, one of which is reported.

CASE 5 A young married woman, aged twenty-five, said that as a child she had fallen from a considerable height on both hands. There was a curvature of the distal end of both radii and luxation of both ulnae (traumatic pseudo-Madelung?). In the anteroposterior view of each wrist (Figs 4-A and 4-B) there is the shadow of a small bone between the distal end of the radius and the triquetrum. In Figure 4-A the shadow is elongated, in Figure 4-B, it is more rounded with distinct bone markings. The small ossicles may be regarded as traumatic separations of the tip of the ulnar styloid process or as accessory bones, *ossa triangularia*. The findings of Ernst and Rommelt are in accord with the former theory. In a series of x-rays of 6,000 wrist joints, they found no definite accessory bones, but numerous pseudarthroses, following separation of small fragments, which gave a similar appearance.

There is no convincing reason for regarding the supernumerary bones of the elbow joint as congenital anomalies. On the contrary, everything points to their origin by traumatic separation of the apophyseal ossification centers during earliest childhood. Similarly one may find such rounded isolated bodies at other points on the skeleton where there are apophyses or epiphyses. An example of this is occasionally seen in the separation of the tongue-like apophysis of the tibial tuberosity which then goes on to further development. In the x-rays of juvenile tibiae, taken because of trauma or Osgood-Schlatter disease, one may recognize various stages of this separation, ranging from the barely perceptible to the well developed stage. The author has also found a number of x-rays in which,

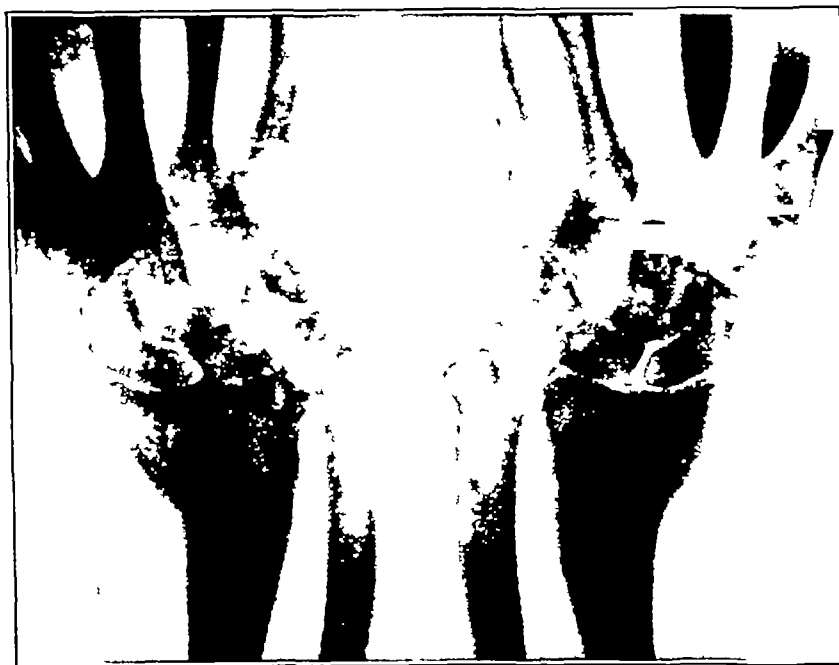


FIG 4-A

FIG 4-B

Case 5 Pseudo-Madelung's deformities with separate ossicles following fracture

at the metacarpophalangeal or metatarsophalangeal joints, there were isolated rounded ossicles, ranging in size from a grain of rice to a small pea. A history of a trauma during childhood has usually been obtained.

In this paper the writer has attempted to discuss only one type of isolated para-articular bone. There are obviously various other causes for such new-bone formation. It is seen in arthrosis deformans and neurotrophic arthropathies. In these cases the underlying disease is so typical and the x-ray appearance so definite that there is no doubt of the diagnosis. In none of the author's patients was there any significant change in the shape of the ends of the bones. Except for the slight injuries or coincident illnesses which brought the patients to the Hospital, nothing of importance appeared on examination.

The isolated ossicles were for the most part accidental findings. Such is their connection with traumatic surgery. The question then arises if such a joint may not be a *locus minoris resistentiae* and react differently to trauma than the normal joint.

CONCLUSIONS

Isolated rounded bones near the medial humeral epicondyle and the so called cubital patella are traumatic in origin. They are the result of the separation of the epiphyseal ossification center in early childhood, without subsequent absorption and with independent further development. The

theory of congenital origin is not convincing. Recent trauma has nothing to do with causing these accessory bones. There is no loss of function of the joint.

REFERENCES

- ATSATT, R. F. Loose Bodies in the Elbow Joint. An Unusual Location and Form. *J Bone and Joint Surg*, XV, 1008, Oct. 1933.
- CRILLOVICH, ROBERT. Ein Beitrag zur pathologischen Knochenneubildung am Epicondylus medialis Humeri. *Arch f orthop u Unfall-Chir*, XXV, 600, 1927.
- ERNST, MAX, UND ROMMELT, W. Über Absprengungen an den Handwurzelknochen. *Deutsche Ztschr f Chir*, CCXLI, 438, 1933.
- EWALD, P. Die Ellenbogenscheibe. *Münchener med Wchnschr*, II, 2015, 1933.
- FEINBERG, B. Beiträge zur Klinik der überzähligen Knochen am Ellenbogengelenk. *Arch f orthop u Unfall-Chir*, XXVIII, 467, 1930.
- FRIEDLANDER, CONRAD. Über Knochenneubildung am Ellenbogengelenk. *Röntgenpraxis*, I, 111, 1929.
- KÖHLER, ALBAN. Grenzen des Normalen und Anfänge des Pathologischen im Röntgenbilde. 6 Aufl. Leipzig, Georg Thieme, 1931.
- KREMSEK, KURT. Ein Beitrag zur Kasuistik der Skelettanomalie (Ellenbogenscheibe). *Röntgenpraxis*, VI, 371, 1934.
- ODESSKY, I., UND MELNIKOWA, L. Zur Kasuistik der Patella Cubiti. *Deutsche Ztschr f Chir*, CCXXXV, 807, 1932.
- PFITZNER, W. Beiträge zum Kenntniss des menschlichen Extremitätenskelets. *Morphologische Arbeiten (Gustav Schwalbe)*, I, 1, 517, 1891-1892.
- SPEED, J. S., AND MACEY, H. B. Fractures of the Humeral Condyles in Children. *J Bone and Joint Surg*, XV, 903, Oct. 1933.
- WÜLFING, MAX. Über akzessorische Knochen des Ellenbogens. *Fortschr a d Geb d Röntgenstrahlen*, XXXIV, 684, 1926.

THE RECOVERY OF FUNCTION IN THE HAND IN CHRONIC ARTHRITIS *

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Dysfunction in the hand from chronic arthritis usually begins insidiously and at times continues after the arthritis is apparently quiescent. The institution of adequate therapy in the early stages of the disease makes it possible to conserve function and to prevent deformity, and prevention is an infinitely easier task¹ than the correction of such deformity as shown in Figure 1. For the sake of convenience, treatment for the rehabilitation of the arthritic hand may be divided into three stages, depending upon the severity of the disease and the amount of deformity present.

The early stage of treatment is limited to those hands in which deformity is sufficient to hamper function, but can be corrected passively. Here the problem remains chiefly the prevention of deformity.² There are certain principles to be kept in mind. Use of the hand should be confined to the things which the patient can do without pain. Rest in the position least likely to cause pain and contracture—about 30 degrees of dorsiflexion of the wrist, with normal contour of the palmar arches,³ and with the fingers in full extension—should be given when the hand is not being used.⁴ Heat, graded exercises, and occupational therapy do much to improve function.

When the deformity can no longer be corrected passively, the second stage of therapy is reached. To the procedures mentioned are added more forceful measures to correct the deformity. Plaster casts are applied with as much correction of the deformity as can be obtained; these casts are changed when additional correction is possible. In the case of more resistant deformity, traction with adhesive plaster is helpful and, when properly applied, is not particularly uncomfortable. When progressive correction does not occur and when the roentgenograms show no bony ankylosis nor marked osseous deformation, manipulation may be undertaken to correct the deformity.⁵ After manipulation, the hand is splinted in the corrected position and kept immobilized for several days, after which heat and exercises are again used. Repeated manipulations are sometimes necessary. They are undertaken, however, only after the reaction from the previous manipulation has subsided and the patient is able to move the joint actively through the corrected range of motion. Manipulation should rarely be undertaken unless the disease has been quiescent for at least a year.

* Read at the Annual Meeting of the American Academy of Orthopaedic Surgeons, New York, N. Y., January 15, 1935.

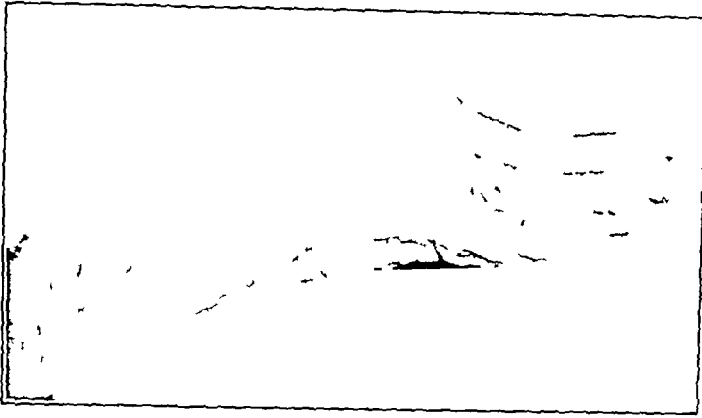


FIG 1

A useless hand marked atrophy of the soft parts, flexion deformity of the wrist, and hyperextension and ankylosis of the fingers

The surgical correction of fixed deformities may be considered the third stage of treatment. In a case where rehabilitation will require a long time, it is well first to estimate the stamina of the patient. Often good treatment, with sequence of the correct orthopaedic manoeuvres, helps little because the pa-

tient's full cooperation is not given. One must also consider how useful the extremity will be after the therapeutic measures have been carried out. It is better to correct functional disturbances at the shoulder and elbow first and then treat the hand. Surgery should be undertaken only when the after-care can be carried on by both patient and surgeon to the desired termination.⁶

At the wrist joint, usually stiff in flexion, there are a number of procedures possible. If the stiffness is fibrous and there is no bony ankylosis, the wrist can be brought into dorsiflexion by manipulation and held in that position by a properly fitted splint. The flatness and distortion of the palmar arches can be corrected by forcibly remodeling the palm over a spherical object. Stiffness in dorsiflexion is usually not disturbed, since it is the best position for function. Arthroplasty of the wrist has occasionally been advocated.⁷ It is a useful procedure if palmar flexion is required. In the quiescent case of arthritis in which there is bony

ankylosis in bad position, the author prefers to do an osteotomy through the proximal carpal bones, with the wrist fixed postoperatively in 30 degrees of dorsiflexion. Stability in the optimum position for function has been the goal at the wrist and carpal joints. (See Figure 2.)

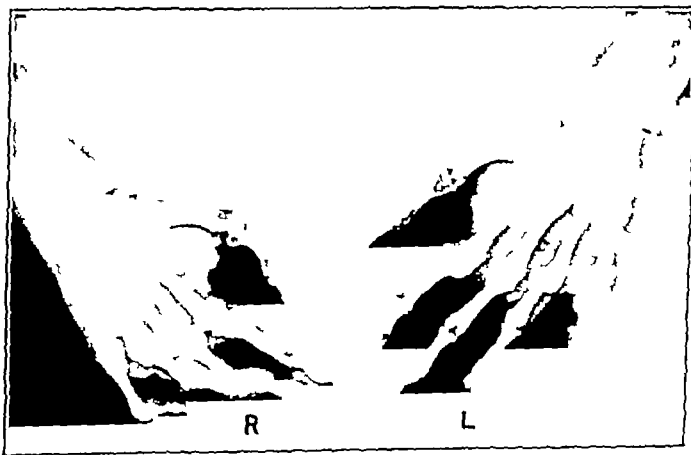


FIG 2

Ankylosis of the carpal bones and of the interphalangeal joints, with deformity

In reconstructive surgery of the meta-

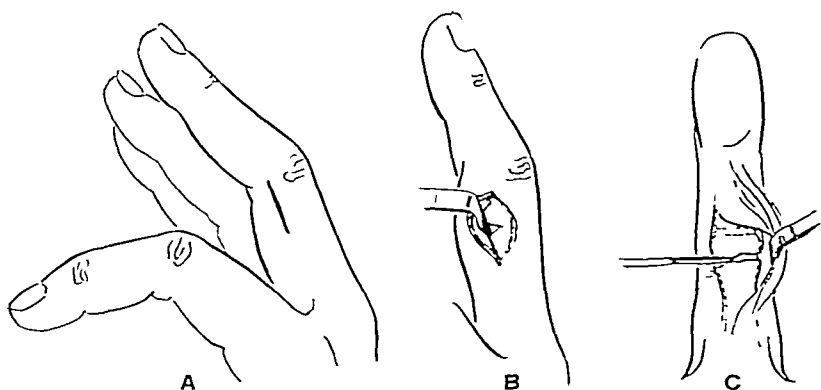


FIG 3

Drawing showing method of freeing contracture of capsule to permit extension of fingers

- A Incision proximal to flexed joint on lateral aspect of joint
- B Retraction of flexor tendons and incision of volar capsule
- C Stripping of volar portion of articular capsule from distal end of phalanx

carpal and phalangeal articulations, it is well to consider the future occupation of the patient. The crude grasping of large tools is possible with stiff, partly flexed fingers. The approximation of fingers and thumb, as in writing and sewing, will require more extensive therapy, and the restoration of the more intricate movements of the fingers separately, as in playing musical instruments, takes a very long time and is not always possible. Arthroplasties and resections at the metacarpophalangeal joints and interphalangeal joints are usually successful in increasing motion in the fingers, provided the arthritis has remained quiescent, the musculature is adequate for motion, and sufficient bone has been removed at operation. When there is subluxation at the metacarpophalangeal joints (which is much more common than ankylosis) a resection of the distal ends of the heads of the metacarpal bones, performed, as in the Heuter operation for hallux valgus, by subperiosteal resection of the distal end of the metacarpal bone with avoidance of injury to the intrinsic muscles, generally gives a finger useful for grasping. Abduction and adduction in a joint of this type increase with continued use. Splints are worn for several months to prevent recurrence of the deformity. The interposition of fascia at this joint is not necessary.

A simple and effective operative procedure for flexion deformity of the finger, with only capsular contracture and no bony ankylosis, is a resection with a tenotome of the proximal end of the interphalangeal articular capsule on the palmar side.⁵ (See Figure 3.) At times, this will permit full extension of the joint. Traction upon the finger distal to the site of operation is sometimes necessary for contracture of the flexor tendons. If traction is not required, the finger is maintained in full extension until healing has occurred. Exercises for active extension are then given.

Arthroplasty of the finger joints has been a relatively successful procedure. Two results are sought in this type of operation: stability and motion. Stability is the more important of the two, it is far better to have a stiff finger joint than an unstable one. For this reason, the type of incision is most important. The author has found that a diagonal incision on the lateral side of the finger, just distal to and parallel to the lateral volar ligament, disturbs the supporting structures of the joint least. The joint capsule, usually firmly adherent all about the bone ends, is incised and pushed back subperiosteally. The proximal end of the

distal phalanx which makes up the joint is not disturbed unless it is so distorted that the normal direction of motion is not possible. Where there is marked distortion, the end is trimmed off squarely. The slips of the flexor and extensor tendons are attached laterally to the proximal end of the distal phalanx forming the joint, and it is usually wise to leave them undisturbed. The joint which is obliterated more by firm fibrous bands than by actual bony ankylosis⁹ is then cut across with a knife or chisel. The distal end of the proximal phalanx which forms the joint is removed for about three-eighths of an inch. The subsequent motion of the

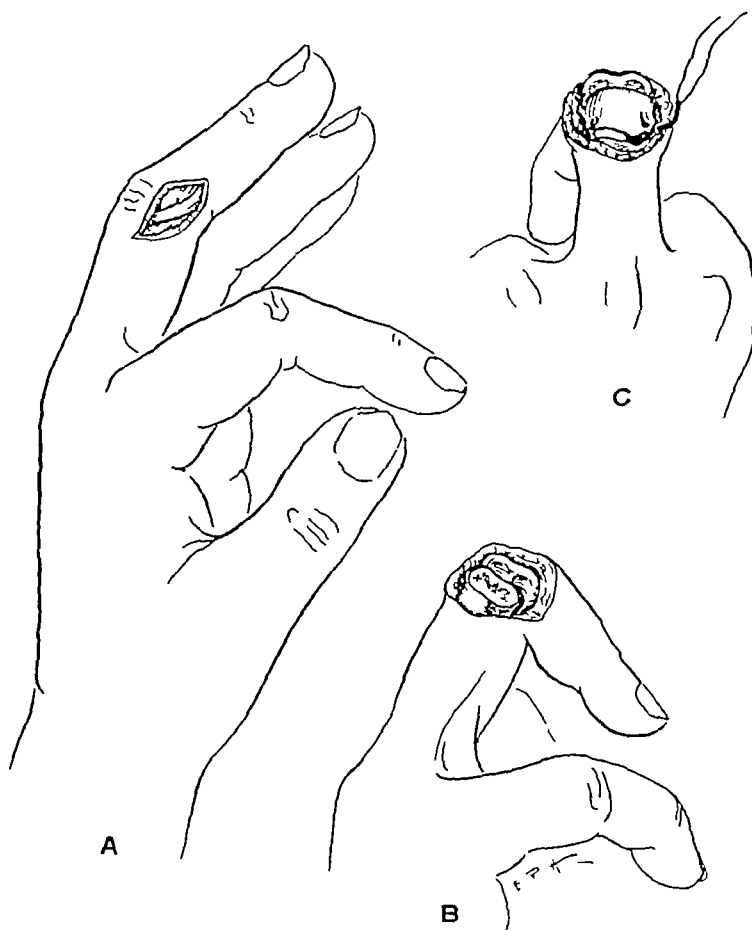


FIG 4

Drawing showing incision and procedure of arthroplasty upon the interphalangeal joints

A Incision distal and parallel to the collateral ligament

B The joint after removal of the distal end of the proximal phalanx

C The resected end of the phalanx covered with a single layer of fascia

joint depends largely on the removal of enough bone, but, if too much bone is removed, an unstable finger may result. The bone is cut off squarely and the volar edge is rounded to make flexion easier, but no attempt is made to secure anything approaching the anatomical restoration of the joint contour. (See Figure 4)

The writer has experimented with interposition of fascia, the turning in of a flap of the joint capsule, and no interposition of tissue between the bone ends¹⁰ Movable finger joints have been observed after all of these methods, but the best and most lasting function has been found in the joints in which a single layer of fascia has been used to cover the distal end of the proximal phalanx Thin pieces of fascia can best be obtained over the bellies of the muscles of the forearm or upper arm These can be removed under local anaesthesia if local anaesthesia is used for the arthroplasty The fascia is securely fastened with fine silk to the reflected articular capsule at the four corners of the joint Curved ophthalmological needles have been found most satisfactory for this The articular capsule is then carefully sutured with fine silk If the operation has been performed properly, the joint should be quite stable and should have about 75 degrees of flexion The skin incision is then closed and adhesive traction is applied, distal to the site of operation, with a rubber band attached to a previously made wire splint This splint is kept in place from a few days to a week Exercises are begun in four days, with the finger in traction A flexed aluminum splint is worn for about two weeks after traction is discontinued The exercises consist chiefly of flexion and extension of the finger Occupational therapy is given, and use of the finger in eating and dressing is encouraged after two to three weeks Unless supervision and exercises are continued for at least six months, a certain amount of the motion will be lost in the subsequent contracture of the scar tissue¹¹ (See Figures 5-A and 5-B)

CONCLUSIONS

1 Improvement in the function of the hand crippled by arthritis is possible, no matter how severe the disability

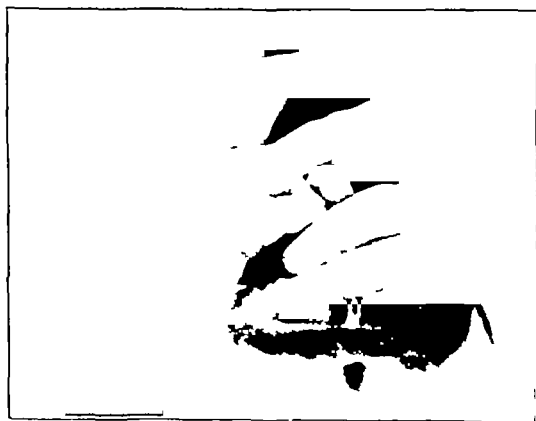


FIG 5-A

Ankylosis of the second and third fingers of the right hand



FIG 5-B

Active flexion of fingers shown in Fig 5-A, eight months after arthroplasty

2 Prevention of deformity in chronic arthritis is much easier and gives a better end result than correction of deformity after the arthritis becomes quiescent. Deformity can be prevented by careful supervision and frequent splinting.

3 It is helpful to divide the treatment for rehabilitation of the hand into three stages. In the first stage, when deformity can be corrected passively, splints, exercises, and heat will usually correct the deformity. The measures are carried out simultaneously with the treatment of the patient for the chronic arthritis.

In the second stage, when deformity cannot be corrected passively and definite bony ankylosis is not present, more active measures, such as manipulations and constant traction should be added.

The third stage of operative correction of deformity should be undertaken in cases of quiescent arthritis only. Surgical procedures should be performed on the hand only after an appraisal of the functional status of the whole arm and with due regard to the functional need of the individual patient.

REFERENCES

- 1 SWAIM, L. T., AND KUHN, J. G. The Prevention of Deformities in Chronic Arthritis. I. The Upper Extremity. *J. Am. Med. Assn.*, XCIII, 1853, 1929.
- 2 BUNNELL, STERLING. Contractures of the Hand from Infections and Injuries. *J. Bone and Joint Surg.*, XIV, 27, Jan. 1932.
- 3 GOLDTHWAIT, J. E. "Flat Hand" (Manus Planus) Its Correction Essential to Normal Function of Hand. *J. Bone and Joint Surg.*, IV, 469, July 1922.
- 4 STEINDLER, A. Orthopedic Reconstruction Work on Hand and Forearm. Report on Early and Late Results. *Surg. Gynec. Obstet.*, XLV, 476, 1927.
- 5 RADFORD, A. Manipulative Surgery. *South African Med. J.*, VIII, 446, 1934.
- 6 KANAVAL, A. B. Splinting and Physiotherapy in Infections of the Hand. *J. Am. Med. Assn.*, LXXXIII, 1984, 1924.
- 7 KOCH, S. L. Disabilities of Hand Resulting from Loss of Joint Function. *J. Am. Med. Assn.*, CIV, 30, 1935.
- 8 SILVER, DAVID. The Role of the Capsule in Joint Contractures. With Especial Reference to Subperiosteal Separation. *J. Bone and Joint Surg.*, IX, 96, Jan. 1927.
- 9 TUBBY, A. H. Some Rare Affections of the Fingers. *British Med. J.*, II, 1069, 1897.
- 10 LORD, J. P. Arthroplasty of the Inter-Phalangeal Joints. *Am. J. Orthop. Surg.*, XIV, 212, Apr. 1916.
- 11 HAMILTON, GAVIN. Arthroplasty of the Thumb and Finger Joints. *Texas State J. Med.*, XIV, 353, 1919.

SHELF STABILIZATION OF THE HIP *

A REPORT OF FIFTY-THREE CASES

WITH PARTICULAR EMPHASIS ON CONGENITAL DISLOCATION

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The first shelf stabilization of the hip at the New York Orthopaedic Hospital was performed for a congenital dislocation in July 1921, but only three such operations were done before 1927. During the period from 1921 to 1933, this operation was performed upon sixty-one hips (fifty-seven cases), and follow-up records were obtained in each case one year, or longer, after operation. The stabilization operation was done on forty-six hips for congenital dislocation, on eight, for infantile paralysis, and, on three, for the residual deformity of suppurative arthritis. Follow-up examinations of less than a year were obtained in four cases not included in this report. The methods and principles used in this study are similar to those of two previous studies^{1,2} of open reduction for congenital dislocation. The cases of congenital dislocation will be considered first, and the significant features of the other groups will be discussed near the close of the paper.

CLINICAL FEATURES

The forty-two patients with congenital dislocation ranged in age between two and one-half and twenty-six years, the average age was twelve years. Half of the group were between ten and twenty years old, eight were above twenty, and only one was younger than four years. Closed reductions of thirty-eight hips and open reductions of two hips had been unsuccessfully attempted. Bilateral dislocation was present in seventeen cases, but bilateral shelf operations were necessary in only four of these cases.

Nearly all of these patients complained of a lump, and 50 per cent of them had pain, fatigue of the hip, and some disability for physical activities such as athletics. Instability was noticed by about one-half of the patients.

On examination before operation, telescoping or instability was found in all of the hips, this disability was moderate in 50 per cent, slight in the remainder. Shortening of the leg was present in all of the unilateral cases, varying between one-quarter of an inch and three inches and averaging one and one-quarter inches. Slight limitation of motion was present in 60 per cent of the hips, and moderate limitation in two

* Read, in part, before the American Academy of Orthopaedic Surgeons, New York, N Y, January 16, 1935.

hips Pain on motion and tenderness were found in only two instances Anteversion of 45 degrees or more was present in half of the cases

ROENTGENOGRAPHIC EXAMINATION

In addition to the ordinary anteroposterior roentgenogram, three other views were taken, as follows with the patient standing on the affected leg, with traction on the leg, and with the pelvis oblique to the film, the rays parallel to the wing of the ilium These views before and after operation were found quite necessary for a proper evaluation of the amount of telescoping, the actual size and shape of the bony support for the femoral head, and the size, position, and relation of the shelf constructed at operation

The femoral head was dislocated to well above the acetabulum and against the ilium in seventeen of the forty-six hips, opposite the superior acetabular margin in the same number, and merely subluxated in twelve hips Telescoping, as measured in the comparative roentgenograms, varied between one-quarter of an inch and one and one-half inches, and averaged five-eighths of an inch The superior acetabular margin was oblique and the acetabulum was shallow in forty-three hips, making it impossible to maintain reduction even if it could have been accomplished The head was deformed in twenty-six instances, the deformity usually consisted of a flattening of the medial half Moderate or marked anteversion was demonstrated roentgenographically in one-half of the hips

USE OF TRACTION

Preliminary traction with adhesive tape and the Thornton well-leg traction apparatus was used in four instances for periods of ten days to six weeks The traction was ineffective for the one hip on which it was used only ten days (patient aged nine years), but in three hips (patients aged seven, ten, and twelve years) the femoral head was pulled down at least an inch A new socket was gouged out of bone just above the acetabulum in two of these cases Irregular ossification and absorption of the portion of the head adjacent to the acetabulum occurred in both of these instances, a result which is considered to be due to the soft-tissue tension associated with the reduction, with resultant circulatory disturbance to the head³ Atrophy of the femoral head also occurred in the fourth case, although the head was not reduced, this, too, was probably the effect of ischaemia

PATHOLOGY AT OPERATION

Four of the forty-six femoral heads were dislocated posteriorly, the remainder, anteriorly Vertical telescoping, as estimated at operation, varied between one-quarter of an inch and one and one-half inches, averaging three-quarters of an inch Anteroposterior and lateral relaxation were slight or absent in the cases of anterior dislocation, but measured one-half an inch or more in the cases of posterior dislocation

Also, in the latter cases, the supporting soft tissues were usually more relaxed and not so strong, and no false acetabulum was present. Moderate or marked anteversion of twenty femora was found. The capsule was ordinarily not opened when a reduction could not be accomplished, so the interiors of only eighteen hips were studied. The acetabular roof was found to be oblique and narrow in nearly all of these hips, and the acetabulum distinctly smaller than the head or with an irregular dome in several instances. The ligamentum teres was absent in ten hips, the capsule was firmly adherent to the neck in four, and in eleven the femoral head was flattened medially or otherwise deformed.

OPERATION

The Smith-Petersen approach was employed in all instances. Two principal types of operations were used, while a third type was employed for two hips. Each of the two principal types was used almost equally prior to 1932, when it became evident that better results were being obtained by the operation in which a broad U-shaped flap of ilium, base downward, was outlined with an osteotome, freed from the ilium, and turned down over the femoral head. This flap usually measured about two and one-quarter inches in length anteroposteriorly, one and one-quarter inches in width laterally, and three-sixteenths of an inch in thickness, these measurements varied with the size of the hip and the amount of lateral and anteroposterior relaxation. The flap almost always remained firmly attached at the base despite the frequent expectation that it would break off in being bent down perpendicular to the axis of the body of the patient through an arc of 60 to 70 degrees, one shelf did break completely free and was driven into a slot cut for it. A portion of the acetabular roof or false acetabulum was included in the flap on six occasions, but it was found that these hips tended to have limited motion. The site of the flap was determined by locating its base at the level of the crest of the head while manual traction of several pounds was being made. The periosteum was elevated and freed to the base of the flap and the paracapsular fat was removed to leave the capsule bare for close contact with the shelf. The flap was held down by one or two blocks of bone cut from another portion of the wing of the ilium and placed obliquely from the lateral margin of the flap to the superior margin of its bed, and sunk slightly at each end if necessary. The resulting triangular space was filled with small fragments of bone cut from the ilium posterosuperiorly.

The second type of operation was done by freeing and springing a flap of bone, base upward, from the ilium and wedging it out over the femoral head the desired distance with a block of bone, the interval also being filled with chips. It was found difficult to cut the flap low enough in this type of operation without cutting into the true or false acetabulum, and often the resulting shelf was some distance above the femoral head in the postoperative roentgenogram. It was usually difficult to spring the flap out far enough to reach the crest of the head without breaking it off,

as the ilium at the base of the flap was usually quite thin. Also, the under surface of the shelf was not as likely to be smooth and level as in the other type.

The third type of operation was based on the Hibbs hip-fusion operation in that an attempt was made to maintain a blood supply for the flap which, with muscles attached, was cut from the greater trochanter anteriorly, transposed, and driven into a slot cut into the ilium at the level of the crest of the head. This operation was found to be more difficult technically and to have no practical advantage over the first type, therefore, its use was discontinued after the first two cases in which fair results were obtained.

Open reduction in eight of the hips was accomplished at the time of the shelf operation, simple reduction in five hips and a gouging of the cartilage of three hips were combined with stabilization by means of a turned-down shelf.

A new socket was cut out of the ilium at the site of the false acetabulum in six hips, three of which had a shelf turned down, and three had flaps sprung out. Fibrous ankylosis resulted in all but one of these six hips, and atrophic changes developed in most of the heads because of disturbance to the circulation by the tension on the soft tissues attached to the neck.³

In two instances, an osteotomy of the femur for the correction of anteversion was performed a few weeks after the shelf operation.

COMPLICATIONS

There were no deaths associated with this operation. Deep infections occurred in two hips: in one, bony ankylosis ensued, with a good result considering this limitation, in the other, healing took place without any ankylosis. There were two superficial infections. Necrosis of a portion of the skin along the incision followed one operation. The femoral head promptly slipped backward to the sciatic notch and above the shelf in three of the four cases of posterior dislocation, in two of which an attempt had been made at the time of the shelf operation to transpose the head forward. In each case, manipulation for correcting the displacement failed to result in maintenance of the head under the shelf. Thus, in a case of posterior dislocation, it seems undesirable to attempt to transpose the head and the shelf should be larger than usual.

POSTOPERATIVE CARE

Anteroposterior and oblique roentgenograms were secured routinely within three days after operation. Aside from the posterior displacements mentioned above, the shelf was found obliquely placed (about 20 degrees) in six cases, too narrow in two cases, and too high (one-half inch or more of space between the bone shadows) in six cases.

Double plaster spicas from the lower thorax to the toes of the affected side were used, with the hip usually in 15 degrees' abduction,

internal rotation, and slight flexion. In seven cases, the anterior half of the spica below the groin was removed at the end of six weeks to permit gentle passive motion, and this practice was found safe and useful. The hips were kept in a spica between seven and fourteen weeks, the average time in plaster was nine weeks. The plaster was removed for active motion in bed as soon as it was considered safe to do so, but weight-bearing was delayed from one to three weeks until, with the aid of exercises and massage, motion and strength had returned to the extremity and the roentgenographic appearance of the shelf was satisfactory.

The patients usually walked fairly well within a month or two after walking had been resumed, and returned to all of their usual activities within from two to four months. Motion in the hips approached the preoperative level in an average of eight months, this period varied from two and one-half to twelve months, with the exception of two cases in which improvement was shown during the second year. In the hips having shelves turned down, normal motion returned in an average of five months, whereas, in those hips having shelves sprung out, the average time required for the return of normal motion was nine months.

TABLE I

RESULTS OBTAINED BY SHELF OPERATION IN CONGENITALLY DISLOCATED HIPs

Anatomical Results

Type of Operation	Number of Cases	Good Per Cent	Fair Per Cent	Poor Per Cent	Hips with Changes Like Coxa Plana
Shelf down	18	78	11	11	1
Shelf down, plus reduction	8	75	0	25	0
Shelf out	12	33	42	25	1
Shelf, plus gouging of ilium	6	0	50	50	4

Symptomatic Results

Shelf down	18	78	22	0
Shelf down, plus reduction	8	100	0	0
Shelf out	12	42	42	16
Shelf, plus gouging of ilium	6	0	33	67

Functional Results

Index of motion		70-100	40-70	0-40
Shelf down	18	61	39	0
Shelf down, plus reduction	8	75	25	0
Shelf out	12	42	50	8
Shelf, plus gouging of ilium	6	17	33	50

DETERMINATION OF RESULTS

The follow-up period in the forty-six congenitally dislocated hips varied from one to nine years, averaging three years. All patients were carefully questioned as to their ability to perform activities usual for their age, as well as to the presence of pain and instability, and the hips were examined with the normal hip as a standard. Roentgenograms were taken in all cases, usually oblique, standing, and traction views were included to determine the quality and efficiency of the shelf. In some cases, the shelf was obviously too high to be effective, and such cases are classed as poor results so far as the operation is concerned.

ANATOMICAL RESULTS

A shelf which, in the roentgenogram, extends laterally at least to the highest point of the head and is separated from it by no more than the thickness of the cartilage and the capsule, which is essentially perpendicular to the long axis of the body, and which presents no atrophic or osteophytic changes of consequence is classified as a good result. A shelf which is obviously too high or too narrow to be at all effective is listed as poor. Shelves between these two classes are grouped as fair. Good anatomical results were found in six of the eight hips having, in addition to the shelf, an open reduction without gouging of bone, but this group includes the youngest and most favorable cases, the other two shelves were poor. Reduction was maintained in all the hips in this group. The best results were obtained in the group with shelves turned down: 78 per cent were good, 11 per cent were fair, and 11 per cent were poor, coxa plana developed in one of the femoral heads. A good result was found in only 33 per cent of the hips with shelves sprung out, whereas in 42 per cent the results were fair and in 25 per cent, poor. Spontaneous bony ankylosis followed infection in one of these cases, and changes like coxa plana occurred in one. Of the six hips with new sockets gouged out of bone, three had fair shelves, three had poor shelves, and four had changes in the head due to circulatory disturbances. Subluxation occurred in two of these hips.

SYMPTOMATIC RESULTS

A patient with no pain or fatigue in the hip, no disability for ordinary activities (including moderate athletics), and less of a limp than before operation is classed as having a good symptomatic result. Such a result was obtained in 78 per cent of the hips with shelves turned down, in 22 per cent, the results were fair. Of the hips with shelves sprung out, a good result was secured in 42 per cent, a fair result in 42 per cent, and a poor result in 16 per cent. The symptomatic results of the young group with open reductions were uniformly good. In four of the six cases in which new sockets were gouged out, the results were poor.

FUNCTIONAL RESULTS

A slight limp persisted in nearly all cases, as would be expected, due to the dislocation of the femoral head, and a moderate limp was present in seven of the forty-six hips. However, the limp was less marked in about 75 per cent. The shortening present before operation was usually diminished by one-quarter of an inch to an inch, the improvement being more noticeable if the comparative measurements were made with the weight on the affected leg. The index of motion¹ averaged 72 in the group with shelves turned down, 62 with shelves turned out, 82 with open reductions and shelves, and 40 with newly gouged sockets (three of these hips were practically stiff). Only nine hips (24 per cent) in the first three groups had an index below 60, all but one of these hips had shelves turned out.

SUMMARY OF RESULTS

In the operations for congenital dislocation of the hip, the best results symptomatically, anatomically, and functionally were obtained in the group having shelves turned down, and in the small group having a simple open reduction with the shelf operation. Good results were secured in about 75 per cent of these cases. The worst results were obtained when a new socket was gouged out of the iliac bone and the position maintained with tension of the soft tissues about the femoral neck. All of the hips were improved except those in the last group and one which became infected.

SHELVES FOR INFANTILE PARALYSIS AND OTHER CONDITIONS

The shelf operation was done eight times for dislocation of the hip to the superior acetabular margin, following infantile paralysis. The patients ranged in age between five and twenty-eight years, the average age was fourteen. The shelf was turned down in three instances and sprung out in five. The follow-up period ranged from one to five and one-half years, averaging three and one-half years. A good result was obtained in five hips, a fair result in one, and a poor result in two in which the dislocation recurred because the shelf was insufficiently low and broad.

The operation was done three times for instability, due to deformity of the acetabulum with atrophy and deformity of the femoral head following suppurative arthritis. There were obtained one good and one fair result and one ankylosis, the latter not due to recurrence of the infection.

CONCLUSIONS

- 1 The shelf operation for stabilization of the hip is indicated for congenital dislocation of the hip in children and young adults when the symptoms justify the operation and the dislocation cannot be reduced or reduction is expected to result in a stiff, painful hip with degenerative changes in the bones.

2 Shelf stabilization should be combined with open reduction when the hip remains unstable even after the cartilaginous acetabulum has been reshaped when practical and the redundant portion of the capsule has been freed and removed. The shelf operation is rarely necessary in patients under the age of five years and is usually inadvisable before that age because of the difficulty of getting the shelf low enough, due to the large amount of cartilage in the acetabular roof.

3 Disturbance of the circulation to the femoral head, followed by changes resembling coxa plana and limitation of motion, often with pain, is likely to result from pulling the femur down so that the position is maintained under constant marked tension of the soft tissues about the femoral neck, regardless of the location of the head.

4 The best results were obtained in the cases reported herewith by using a turned-down flap of ilium, blocked in a position perpendicular to the long axis of the body. Good results were obtained in approximately 75 per cent of the hips on which this type of operation was performed.

5 Early mobilization of the hip is desirable, but weight-bearing should usually be delayed until active control of the hip is reasonably good and the roentgenogram shows the shelf to be sufficiently strong.

6 It is rarely advisable to correct the anteversion by a shelf operation without reduction, as the femoral head is less likely to dislocate beyond the shelf if its relation to the ilium is not disturbed. Similarly, transposition of the femoral head is inadvisable.

7 Shelf stabilization is indicated for selected unstable hips, due to such conditions as infantile paralysis and deformities following suppurative arthritis.

REFERENCES

- 1 HOWORTH, M B, AND SMITH, H W. Congenital Dislocation of Hip Treated by Open Operation. A Report of Seventy-Two Cases. *J Bone and Joint Surg*, XIV, 299, Apr 1932.
- 2 FARRELL, B P, AND HOWORTH, M B. Open Reduction in Congenital Dislocation of the Hip. *J Bone and Joint Surg*, XVII, 35, Jan 1935.
- 3 FERGUSON, A B, AND HOWORTH, M B. Coxa Plana and Related Conditions at the Hip. Part I Classification and Correlation of these Conditions. Part II A Study of Seventy-Five Cases of Coxa Plana. *J Bone and Joint Surg*, XVI, 781, Oct 1934.

ANATOMICAL OBSERVATIONS ON SENILE CHANGES IN THE SHOULDER*

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The senile shoulder shows certain defects which lend themselves to study in the dissecting room. These defects are apparent to the naked eye, some of them indeed are rather striking. They present no great difficulty of demonstration, and may be found as frequently as in one cadaver out of every six.

The regular occurrence of such lesions suggests certain questions regarding etiology, symptomatology, and treatment, partial answers to which are to be derived from a study of the lesions themselves.

Certain observations resulting from a similar but less extensive study have already been reported by the writer¹. These observations, together with others of more recent date, are presented herewith.

A total of 192 shoulders have been examined. Most of the shoulders were being dissected routinely by first-year medical students in the Department of Anatomy of the Washington University Medical School under the direction of Dr. Robert J. Terry. Other cadavera were undergoing special dissection by members of Dr. Terry's staff. There was no special selection of material, the cadavera being examined as they came. Nothing in the technical preparation of the cadavera for dissection seemed likely to produce artificial lesions in the shoulder.

A total of ninety-eight cadavera were examined, bilateral observations being made in all but four instances. Certain lesions of the shoulder were found, listed as follows according to frequency of occurrence. These lesions were:

1. Partial rupture of the tendon of the supraspinatus muscle
2. Knobbing or irregular hypertrophic changes of the greater tubercle and adjacent regions of the humerus
3. Deposits of calcium within the supraspinatus tendon
4. Adhesions within the subacromial or subdeltoid bursa. The author wishes to make it clear that the subacromial and the subdeltoid bursae are assumed to be identical, and the term "subacromial" is hereafter used exclusively.
5. Erosion of the floor of the subacromial bursa
6. Increased fragility of the bone of the greater tubercle
7. Erosion of the articular surface of the humerus

* Read at the Annual Meeting of the American Academy of Orthopaedic Surgeons, New York N. Y. January 15, 1935.

At this point certain negative findings in the shoulder may be listed

1 The tendon of the supraspinatus muscle was in no instance found completely torn through,—that is, torn across from border to border. Such tears or ruptures as were found were confined within the borders of the tendon.

2 No tear of any tendon other than that of the supraspinatus was observed.

3 The long head of the biceps brachii muscle was intact in every instance. Fraying of this tendon was not observed.

4 The head of the humerus was dislocated in no instance.

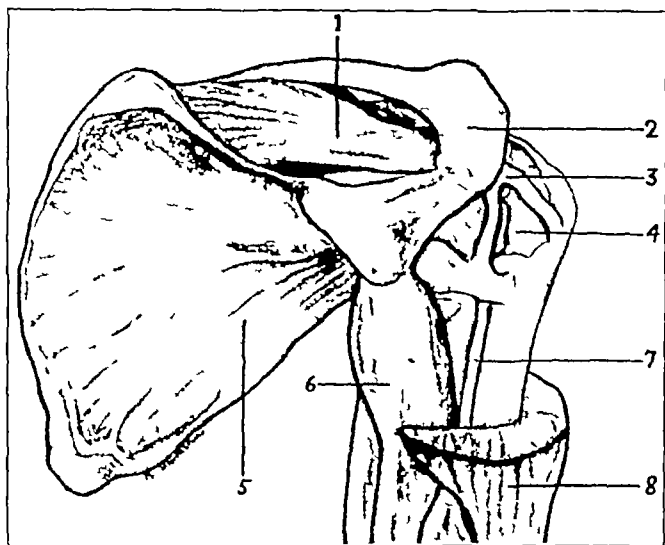


FIG 1

Anterior aspect of a dissected left shoulder of the cadaver of a male negro, eighty-five years of age. Through a partial rupture of the supraspinatus tendon at 2 may be seen the cavity of the shoulder joint and the exposed head of the humerus. The subacromial bursa has been dissected away to show the split tendon of the supraspinatus, 3, and the insertion of the short rotators into the joint capsule. The long head of the biceps brachii is marked 7. (Courtesy of *Annals of Surgery*)

5 Evidences of fracture, either old or recent, of the humerus, acromion, or clavicle, were lacking.

6 No foreign bodies—such as calcium accretions, fibrin balls, or villous projections—were found free within the shoulder joint or the subacromial bursa.

7 Erosion of the articular surfaces of the shoulder joint, unassociated with rupture of the tendon, was not observed.

Deferring, for a moment, discussion of the negative findings, it may be remarked that the various individual positive

findings were closely related, often being found together but sometimes alone.

Of all the lesions, partial rupture of the supraspinatus tendon was the most common, it was found in 17 per cent of the cadavera (eighteen out of ninety-eight). This lesion was present in 13 per cent of shoulders (24 out of 192). Females were afflicted a little more frequently than males (19 per cent of females, 18 per cent of males). Negroes were afflicted slightly more often than whites (19 per cent of negroes, 18 per cent of whites).

Older cadavera more often possessed the lesion than younger ones. The youngest cadaver with a torn tendon was forty-five years old. The average age of the entire series of afflicted cadavera was sixty-three years, the average age of the group with lesions of the supraspinatus tendon was

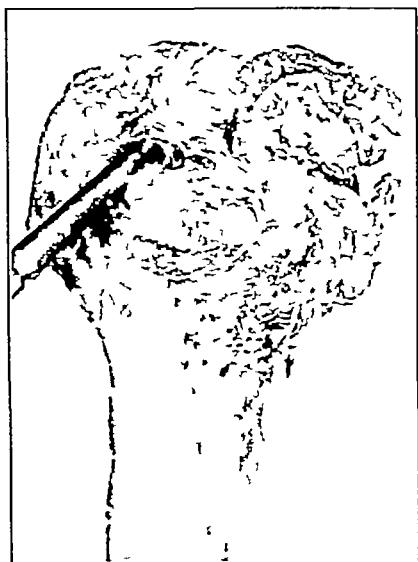


FIG 2

A roughly dissected head of a right humerus of another cadaver. The probe passes through a partial rupture of the supraspinatus tendon.



FIG 3

Shoulder joint shown in Fig 1, viewed from within. The perforation through which the joint communicates with the subacromial bursa is shown as a white circle. Roentgenographically, such a shoulder joint might be outlined clinically, following injection into the subacromial bursa of a radiopaque substance. The substance would flow freely from the bursa through the perforation into the joint.

fifty-three years. The incidence of the lesion increased with advancing years.

Bilaterally torn tendons were present in six cadavers, unilaterally torn tendons in twelve. Of the unilateral group, seven lesions were in the left shoulder and five in the right. Figure 1 shows one of the largest of these lesions.

The perforation through the joint capsule is better shown in Figures 2 and 3. Both of these were partial tears. Complete rupture of the supraspinatus tendon was not found in this series of cadavers. A variable amount of untorn tendon always remained on each side of the tear. The other tendons of the shoulder joint were intact in every cadaver examined. The long head of the biceps brachii was likewise intact.

While most of these ruptures involved both the supraspinatus tendon and the underlying joint capsule, some did not.

The largest rupture of this series (Cadaver 1058) had a base, measured along the greater tubercle, of 2.2 centimeters and an altitude of 3.5 centimeters. Few ruptures were smaller than that shown in Figure 2, which represents an average size,—i.e., one centimeter in diameter.

Even when a large rupture was present in its tendon, the supraspinatus muscle itself showed no atrophy as compared with the infraspinatus or teres minor muscle.

Figure 4 shows a cross section of a normal tendon near its insertion.

into the greater tubercle. Figure 5 shows a section through the supraspinatus tendon adjoining a rupture. In it the cells do not stain as well as in Figure 4, and nests of curled connective-tissue fibers are observed, probably the result of secondary contracture of the torn fibers. There is also fraying of the surface. There is no foreign-body reaction or round-cell infiltration. No calcium is present. Necrosis is absent.

Although in this series calcium deposits were never discernible to the naked eye and are not seen in Figure 5, they were positively identified in two other specimens,—microscopically, in one of them (Fig 6), and roentgenographically in the other (Fig 7).

Changes occurring in the bone consisted of surface irregularities or knobbing, readily visible in the gross specimen. These irregularities varied from small protuberances to extensive piling up of new bone, often soft and pitted, sometimes with plateau formation and lipping. These lesions were found chiefly about the greater tubercle, and were most extensive when associated with large tears of the supraspinatus tendon. Occasionally, adjacent parts of the bone were involved.

Surface irregularities of the lesser tubercle of the humerus were observed in a few cadavera. Occasionally, bony irregularities occurred

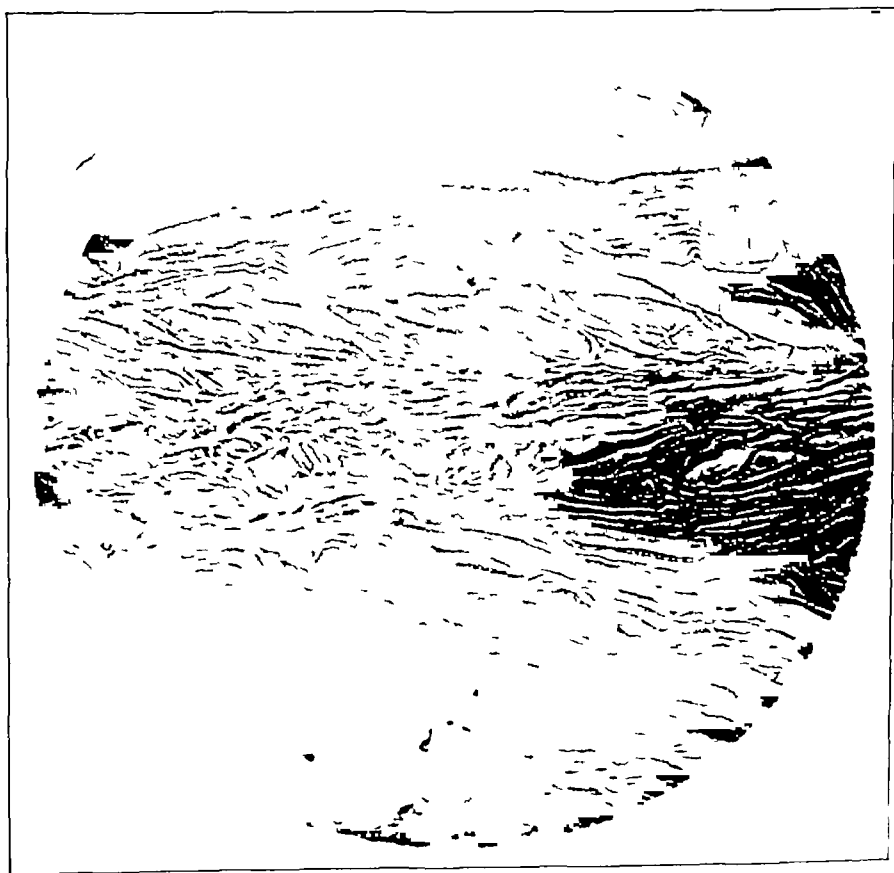


FIG 4

Photomicrograph of a normal supraspinatus tendon near its insertion into the greater tubercle. (Cadaver 1263, right shoulder.)

without an accompanying tear in the tendon, but the two lesions were usually associated. Sometimes the upper part of the head of the humerus was also involved.

Other changes in bone consisted in decalcification, increased fragility, and atrophy.

Joint surfaces were invariably smooth except in one cadaver where some of the exposed fibrocartilage showed gross evidence of erosion. A large partial rupture of the supraspinatus tendon accompanied this lesion.

Changes in the subacromial bursa consisted for the most part in variations of size and shape. Some bursae, however, were almost completely obliterated by fibrous adhesions, tough or fine. Erosions on the floor of the bursa were occasionally encountered, and involved the serous layer and some of the superficial fibers of the supraspinatus tendon. One of these erosions was remarkable for its resemblance, both in shape and location, to rupture of the supraspinatus tendon, although the tendon was intact in this instance. One bursa was double, being bisected by a fibrous partition. None of the bursae contained free calcium accretions, or rice

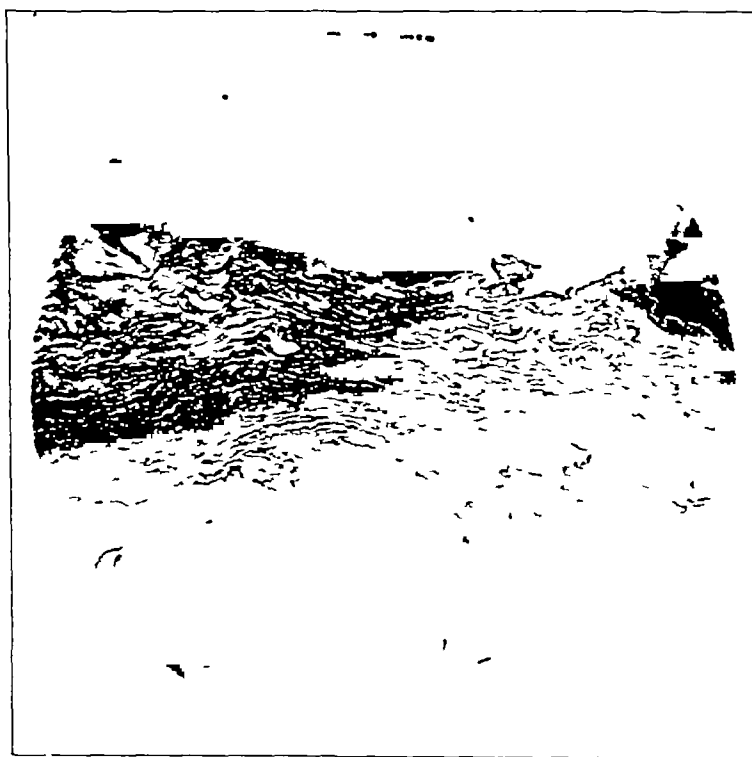


FIG 5

Photomicrograph of a ruptured supraspinatus tendon near its insertion into the greater tubercle. Degenerative changes are shown. (Cadaver 103S, right shoulder.)

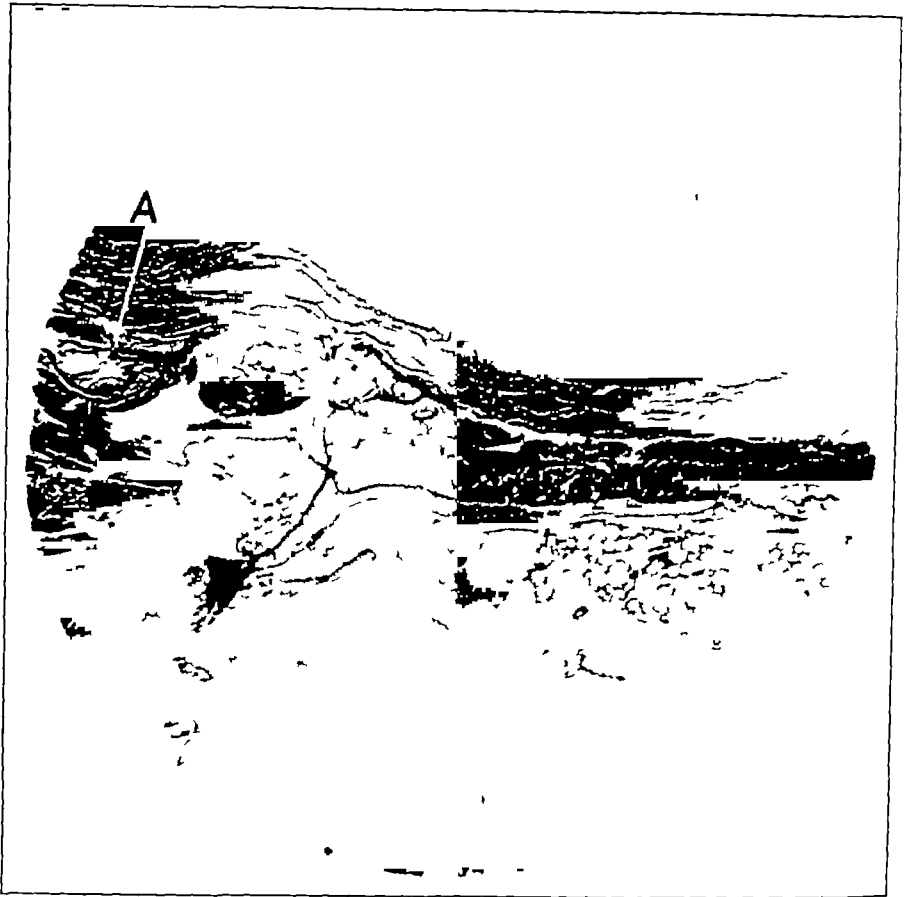


FIG 6

Photomicrograph of a ruptured supraspinatus tendon at its insertion into the greater tubercle, showing a calcium deposit, A, within the tendon. Degenerative changes also appear (Cadaver 1249, left shoulder)

bodies, etc. Their walls showed no villous projections and, with the exceptions already noted, were always smooth. Such calcification as occurred was always found in the underlying tendon.

Most of the individuals in this series died of cardiorenal disease, tuberculosis, or carcinoma. No causative association was found between disease and the lesions in the shoulders. Correlation with symptoms was impossible.

These lesions in the shoulder are of a different type in certain respects from the lesions of the region commonly reported in the literature. They closely resemble the lesions reported by Codman and Akerson² and are probably similar in origin to those lesions of tendons, bursae, and joints described by them and by Meyer³ and attributed by the latter to trauma with attrition. They differ from the complete rupture of the supraspinatus tendon following trauma, found at operation by Codman⁴, Wilson⁵, and Fowler⁶, and they also differ from the infectious changes of the subacromial bursa found chiefly at operation by Codman^{2,4}, Brickner⁷, Moschcowitz⁸, Hitzrot⁹, Rogers¹⁰, and others. They also have certain features in common with erosions of articular surfaces of human knee

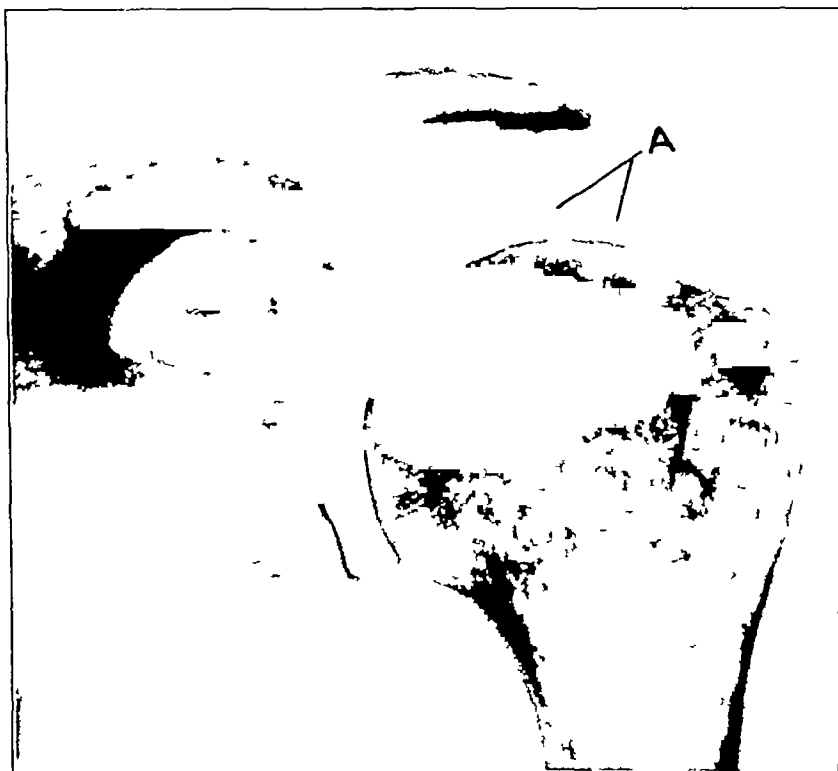


FIG 7

Roentgenogram of museum specimen shown in Fig 1. Shadow at A is interpreted to indicate calcification of the supraspinatus tendon.

joints, as described by the author¹¹ and by Keefer and Myers¹², and with similar lesions of knee joints of cattle, as reported by Bennett and Bauer¹³.

Since the lesions here described are more common in older individuals and are often bilateral, they would seem to be caused by some factor in addition to trauma and long-continued wear. Meyer³ offers the hypothesis of attrition, or failure of bodily reparative processes to function adequately, added to the factors of long-continued trauma, use, and disuse. The absence of indications of inflammation in most of the lesions of this series lends support to Meyer's hypothesis. Likewise supporting his hypothesis is the similarity of the present lesions to erosions of the articular surfaces of the knee joint,—a degenerative type of lesion, described elsewhere by the author¹¹ and by others.^{3, 12, 13}

Infection seemed a factor in certain cases, judging from the occasional presence of old adhesions within the subacromial bursa. These adhesions resembled the adhesions encountered in the peritoneal cavity, particularly in the pelvis of female subjects. Infection also seemed indicated by the hypertrophic bony changes sometimes present. However, these findings

were infrequent, and microscopic evidence of inflammation was lacking. Infection was, therefore, thought to play a rôle in only a minority of these shoulder lesions.

In conclusion, these lesions in the shoulder were considered to be traumatic and degenerative in nature. Age, long use, and trauma seemed the chief causative factors. Alterations in tissue growth and metabolism were believed to act locally to aid in the formation of the lesions. Infection was thought to cause the changes seen in very few of these shoulders.

Acknowledgment is gratefully made by the author for the assistance rendered by Dr J A Key, Dr Wendell Scott, Dr Mary Schmeckebier, Mr Irving Harris, Miss Marie Olds, and Mr P A Conrath, also for a grant to Washington University from the Science Research Fund of the Rockefeller Foundation.

REFERENCES

- 1 KEYES, E L Observations on Rupture of the Supraspinatus Tendon Based upon a Study of Seventy-Three Cadavers *Ann Surg*, XCVII, 849, 1933
- 2 CODMAN, E A, AND AKERSON, I B The Pathology Associated with Rupture of the Supraspinatus Tendon *Ann Surg*, XCIII, 348, 1931
- 3 MEYER, A W Further Evidences of Attrition in the Human Body *Am J Anat*, XXXIV, 241, 1924
- 4 CODMAN, E A The Shoulder Rupture of the Supraspinatus Tendon and Other Lesions in or about the Subacromial Bursa *Boston, Thomas Todd Co*, 1934
- 5 WILSON, P D Complete Rupture of the Supraspinatus Tendon *J Am Med Assn*, XCVI, 433, 1931
- 6 FOWLER, E B Stiff, Painful Shoulders, Exclusive of Tuberculosis and Other Infections *J Am Med Assn*, CI, 2106, 1933
- 7 BRICKNER, W M Prevalent Fallacies Concerning Subacromial Bursitis Its Pathogenesis and Rational Operative Treatment *Am J Med Sciences*, CXLIX, 351, 1915
- 8 MOSCHCOWITZ, ELI Histopathology of Calcification of the Spinatus Tendons as Associated with Subacromial Bursitis *Am J Med Sciences*, CL, 115, 1915
- 9 HITZROT, J M Surgical Diseases of the Shoulder Bursae *Ann Surg*, XCVIII, 273, 1933
- 10 ROGERS, M H A Study of One Hundred Cases of Subdeltoid Bursitis *J Bone and Joint Surg*, XVI, 145, Jan 1934
- 11 KEYES, E L Erosions of the Articular Surfaces of the Knee Joint *J Bone and Joint Surg*, XV, 369, Apr 1933
- 12 KEEFER, C S, AND MYERS, W K The Incidence and Pathogenesis of Degenerative Arthritis *J Am Med Assn*, CII, 811, 1934
- 13 BENNETT, G A, AND BAUER, WALTER A Systematic Study of the Degeneration of Articular Cartilage in Bovine Joints *Am J Pathol*, VII, 399, 1931

BUNIONS

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During the past twenty years at the California State Prison, 129 cases, representing 211 bunions, have been studied and operated on. In all of these cases, spinal anaesthesia has been used and the operative technique employed has been that described by Singley¹ in 1913. He adopted this from Fowler² who used the procedure first brought out by Petersen³ in 1888.

In this operation, the incision is made through the web between the great and second toes, thus giving access to the outer aspect of the metatarsophalangeal joint. The capsule is incised transversely, exposing the articular surfaces. The great toe is then forcibly disarticulated medially and backward. The exostosis is brought to view and completely removed with a chisel. The toe is next replaced. No sutures are used, with the exception of four or five of silkworm-gut through the cut edges of the skin and down to the capsule.

Gauze is placed over the wound and the great and second toes are bound together. A tongue-blade splint is adjusted along the inner side in such a way as to hold the splinted toes in a straight line with the foot. The sutures are removed within ten to fourteen days, and the splint is re-adjusted and left on for two weeks more. The patient may bear his weight at the end of a week.

Sandals or slippers with a Japanese sock or foot mitten are worn during convalescence. The period of hospitalization is one week and that of disability three to four weeks.

There are three characteristics of this disease:

- 1 The hallux valgus,
- 2 The exostosis,
- 3 The bursitis.

Although it may seem of minor importance, this condition is painful, crippling, deforming, unsightly, and the cause of considerable disability.

Of the 129 cases, twenty-six individuals, representing forty-two bunions, were reexamined from two and one half months to four years and two months after operation. The average length of time which elapsed between the operation and the follow-up examination was twenty months. The end results obtained by this operation in these forty-two cases were as follows:

Result	Excellent	Good	Fair	Poor
Anatomical	10	14	12	6
Functional	20	20	2	0



FIG 1
Showing site of incision



FIG 2
Showing head of metatarsal exposed



FIG 3
Great toe disarticulated and displaced backward

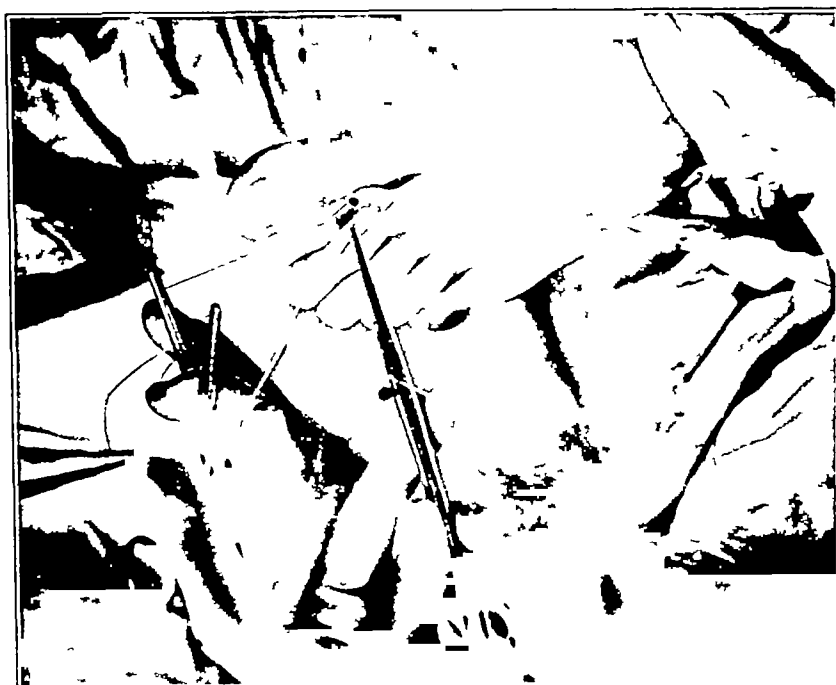


FIG 5
Silkworm-gut sutures in place



FIG 4
Exostosis being chiseled



FIG 6

Wound dressed Tongue-blade splint adjusted

- 2 The weight-bearing buttress of the great toe is not disturbed
- 3 The period of disability is minimized
- 4 Danger of ankylosis of the joint is negligible
- 5 The technique is simple and the amount of trauma is slight

SUMMARY

In 129 individuals representing 211 bunions, the web incision between the great and second toes has been used. The exostosis has been removed, after backward and inward disarticulation of the great toe, and the results have been uniformly good.

REFERENCES

- 1 SINGLEY, J. D. The Operative Treatment of Hallux Valgus and Bunion. *J. Am. Med. Assn.*, LXI, 1871, 1913.
- 2 FOWLER, G. R. A Treatise on Surgery, II, p. 622. Philadelphia, W. B. Saunders Co., 1906.
- 3 PETERSEN, FERD. Zur operativen Behandlung verkrümmter Zehen. *Arch. f. klin. Chir.*, XXXVII, 678, 1888.

In the six cases classified as poor anatomical results, the functional results were good. A slight valgus had recurred in one of them, but it had not produced any disabling results. In this period of twenty years, no patient has needed a secondary operation and none has complained of a poor result.

It is felt that the operation has the following advantages:

1. The scar is not exposed to subsequent trauma from shoes.

FRACTURES OF THE CARPUS*

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The history of the treatment of carpal fractures may be divided into three separate periods. The first period, when such fractures were called sprains, with no recognition clinically of fracture, ended when anatomical dissection disclosed unhealed fractures of the navicular. These were often called bipartite or naturally divided bones, even as late as the issue of Dwight's Atlas in 1907. A second period of some twenty years' duration followed, during which advances in the use of the roentgen ray and its application to the studies of injured wrists, after recognition of carpal fractures, led to a study of the mechanism and pathogenesis of the lesions. A third and recent period, of some five years' duration, has been characterized chiefly by an effort to get away from mutilating operations for removal of bone and to obtain bony union by simple methods, leaving the osseous architecture of the wrist intact and aiming at restoration of physiological function. As a result of the perseverance of investigators in the study and interpretation of clinical observations, these fractures may now be placed in a class with those of other parts of the skeleton, the healing and prognosis of which are quite well established.

As the writer has stated elsewhere, it was known prior to 1930 that the sequence of fractures of the carpal bones in frequency of occurrence was lesions of the navicular, lesions of the lunate, and the complicated fracture-dislocations between proximal and distal rows of the bones, trailed by rarer lesions of other bones. It has been shown that a fracture of the navicular, recognized immediately, immobilized, and kept at rest for eight to ten weeks, may progress clinically to bony union and, at times to nearly full restoration of function. Some unrecognized fractures, untreated, given no rest, and forced in use or subjected to futile treatment by heat and massage, may go on to bone absorption within the body of the navicular and to aseptic death of the cancellous portion of a whole fragment. Cavity formation within the bone may follow; no effort at new bone formation may be seen, but there are frequently found changes involving the adjacent joints and the synovia, which may become thickened and pedunculated, along with osteo-arthritis new bone from the radius or other neighboring bones. Pain, stiffness in the wrist, and diminished function, which seems disproportionate for such a minor fracture, often result.

Based on the knowledge acquired from the various roentgeno-

* Presented before the American Orthopaedic Association Philadelphia, Pennsylvania June 7, 1935

graphic and pathological studies, as well as from a review of the large number of these injuries recorded in the surgical literature, sure methods of therapy have been evolved. A resting stage in the advance of treatment may persist until dissatisfaction with results short of ideal drives surgical investigators to renewed study in order to secure happier and speedier functional returns.

Treatment for recent fracture of a carpal bone, diagnosed within a day or two after injury, requires immobilization in plaster-of-Paris. Particularly is this demanded for the bones of the proximal row, the blood supply of which is often largely cut off by fracture. The greater range of motion in the proximal row calls for an extensive cartilaginous surface to articulate with the radius and the distal row over the arcs of wrist movement. This proportionately large joint or cartilaginous surface reduces the area of ligamentous and capsular attachment to these bones, especially the navicular, and thereby lessens the area in which blood supply may reach the bone directly, either by small nutrient or periosteal vessels. Fracture of these bones, of any character—crushing, comminuted, linear, or fragmenting—must cut off or greatly diminish a rather poor blood supply, and the subsequent train of bone changes seems largely dependent on this fact. The bones of the distal row have a relatively smaller area of cartilaginous or joint surface. They move but little on each other and have a broader surface for penetration of the blood vessels and vascularization, which helps in case of fracture. In a case of fracture of the two rows, the prognosis seems commensurate with the interrupted blood supply. In the recent fracture, without gross fragment separation, prolonged immobilization in circular plaster-of-Paris from just below the elbow to the base of the fingers, with the thumb completely encased, does much to aid the reestablishment of the blood supply and subsequent union. The plaster must be heavy enough to withstand the wear of at least two months. With this treatment, one may look for union in practically all instances of fracture of the distal row and in a majority of cases of fracture of the proximal row. Immediately after the plaster is removed, roentgenograms in two axes must be made, before motion in the wrist is permitted. If there is any doubt about the union—if the trabeculae of the bone appear to have failed to fill in the separation or narrow plane of the fracture—the hand and wrist must again be immobilized in the same type of dressing for an additional six or eight weeks. At the expiration of the second period, a similar roentgenographic examination is made to ascertain if bony union has taken place. One should not hesitate to insist upon a third or even a fourth period of immobilization for a slowly healing bone which may have suffered extensive aseptic necrosis and may require much bony replacement. If union is not obtained in six to eight months, recourse must be had to operative treatment, followed in each instance by prolonged immobilization and roentgenographic examination.

Early and prolonged immobilization overcomes pain and, in the

average instance, does not seem to aggravate stiffness of the wrist. If traumatic arthritis, with cartilage changes in the radius and neighboring carpal bones, does not appear, a good prognosis as to freedom from pain and range of motion may be given.

It is still the author's belief that radial flexion and slight dorsiflexion is the position of election for the treatment of most carpal fractures, but he has obtained bony healing with the wrist in other positions. The length of the immobilization period and, possibly, the age of the patient and the vigor of the circulation are apparently weightier factors in bone healing than position alone, although some surgeons believe that mild pressure from the capitatum on the other bones, particularly on the navicular, may force the fragments together and favor union.

The ununited, neglected, even partly absorbed or cavitary carpal bone may be coaxed back to health, normal density, and even union by many months of such immobilization in plaster-of-Paris. No other splinting method for the wrist suffices. Schnek has recorded the cases of twenty-five patients thus treated, with favorable results.

If the bone fails to unite, or if the surgeon desires to assist the process, other recourses are available. As is the case in any fracture, operation permits direct attack upon the fragments, the resulting stimulation by local irritation may lead to increased or freshened blood supply and a deposition of osteoid tissue, ending in union.

Operation may be required for delayed union or non-union, with or without apparent bone absorption and cavity formation. Some cases of delayed union yield to the immobilization treatment alone. The old method of drilling osseous fragments to establish increased blood supply across a plane of fibrous union or non-union fills the requirements of most cases. Drilling the navicular was performed by Beck in 1929 and has since been done by Schnek, Stendler, the writer, and others. On the basis of causing the least possible disturbance of the remaining blood supply of the bone by exposure with reflection of the capsule or periosteum, the smallest possible avenue of approach is sought. In the case of the navicular, on account of its peculiar anatomy and the subcutaneous situation of the tuberosity, drilling into both fragments, via the *tabatiere anatomique* directly through the tuberosity, causes the least surgical trauma. It is not necessary to make an incision over the dorsum of this bone to obtain effective drill holes, and it is doubtful if any effort to freshen the fracture surface adds to the value of the drilling, even if it does not detract from it. Multiple drill channels may be indicated; usually one channel, one-eighth of an inch in diameter and drilled well through into both fragments, is sufficient. The post-operative splinting in plaster-of-Paris is imperative.

Into drill holes thus penetrating both fragments, particularly in the navicular, small bone transplants from the tibia may be inserted, as advocated by Murray. Whether they hasten bony union or guarantee it is as yet unknown. The author believes these transplants are not essential.

He also feels that bone transplants, laid on or through the navicular by wider avenues of exposure than those obtained by drilling of the *tabatière anatomique*, as done by Adams and others, may not assist union, in fact, such transplants may militate against it. Any carpal bone may be drilled through a very small opening advantageously placed.

One final method of operative treatment is reserved for the long-standing and obdurate cases, particularly those of the distal row or of the proximal row where removal of bone is not desired or is refused. An operation for fusion with neighboring bones, by freshening the adjacent bone surfaces to permit new blood supply from a healthier carpal bone, promises freedom from pain and considerable restoration of the dead fractured bone. This method has been successfully used by Thornton to ameliorate the condition caused by a dislocated capitatum. Fusion, instead of complete excision, is also suggested, in cases of so called Preiser's disease and Kienbock's disease of the bones of the proximal row, to obtain a painless revived bone.

Excision of one or more bones of the carpus will probably be reserved for the cases of irreducible fracture-dislocation, especially when the median nerve is pressed upon. By substituting fusion for excision, the carpus will be saved the shortening or lack of osseous support subsequent to excision. From the standpoint of range of joint motion, strength of hand, and freedom from pain, the functional results may be better after local fusion of one carpal bone to its neighbors than after excision.

REFERENCES

- BECK, A. Zur Behandlung der verzögerten Konsolidation bei Unterschenkelbrüchen. *Zentralbl f Chir*, LVI, 2690, 1929.
- MURRAY, GORDON. Bone-Graft for Non-Union of the Carpal Scaphoid. *British J Surg*, XXII, 63, 1934.
- SCHNEK, FRITZ. Die Behandlung der verzögerten Callusbildung des Os naviculare manus mit der Beck'schen Bohrung. *Zentralbl f Chir*, LVII, 2600, 1930.
- Die Verletzungen der Handwurzel. *Ergebn d Chir u Orthop*, XXIII, 1, 1930.
- SPEED, KELLOGG. *Traumatic Injuries of the Carpus, Including Colles' Fracture*. New York, D Appleton & Co, 1925.
- A Text-Book of Fractures and Dislocations Covering Their Pathology, Diagnosis, and Treatment. Ed 3. Philadelphia, Lea & Febiger, 1935.
- STEINDLER, A. Fracture Disabilities of the Wrist. *Surg Gynec Obstet*, LVIII, 487, 1934.
- THORNTON, LAWSON. Old Dislocations of Os Magnum, Open Reduction and Stabilization. *Southern Med J*, XVII, 430, 1924.

The average age of the patients was fourteen years. The number of days following surgery before the lengthening process was started averaged seven and one-half. The average length obtained was one and nine-tenths inches. The number of days required to obtain this length was thirty-five, making the average daily increase in length one and three-tenths millimeters. The average time before the pins were removed was eleven and four-tenths weeks. In seven cases, the side bars of the apparatus were removed and the cast applied with the pins still in place.

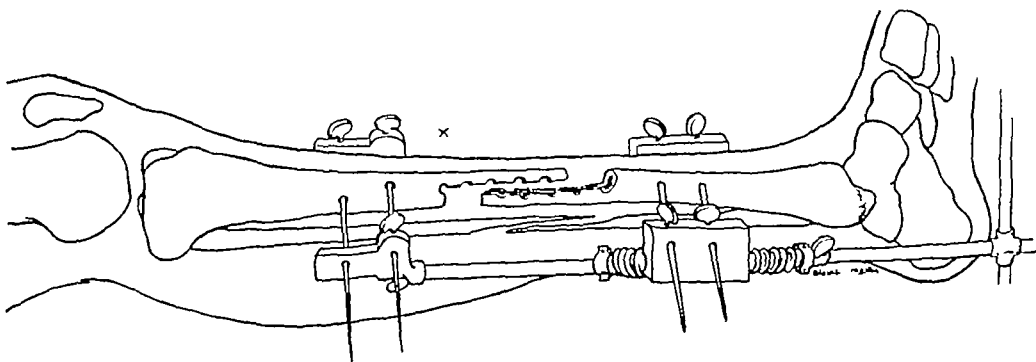


FIG 1

Drawing showing the plane in which the tibia is osteotomized when the principle of one off-center pin is used. The pin (x) is set slightly more anteriorly than the other three pins. This forces the proximal fragment posteriorly, counteracting the tendency toward anterior bowing.

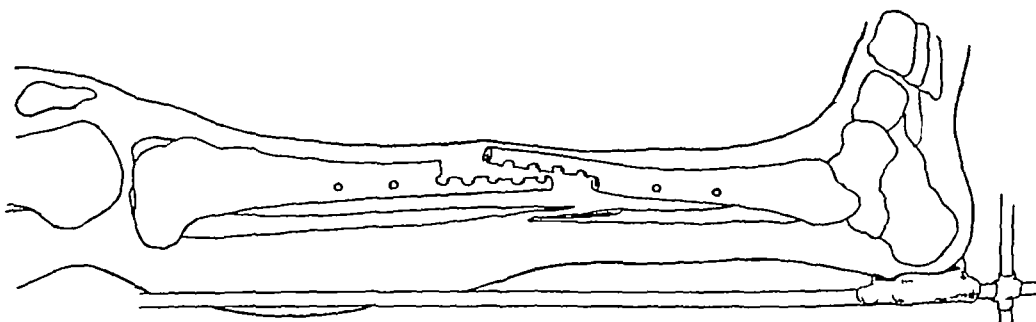


FIG 2

Drawing showing the plane in which the tibia is osteotomized when the pins are set in the same plane. If anterior bowing occurs, a lift is applied under the heel and attached to the side bars. Greater correction can be obtained if one of the lower pins is removed.

This was done because, upon removing the apparatus, there was found to be very little stability at the osteotomy site, and it was not thought safe to remove the pins for fear of losing some of the length.

The average time that plaster was worn, following the removal of the pins, was thirteen weeks. The average time before full weight-bearing was allowed was nine and one-half months. This figure may seem a little high, but it is to be remembered that, in most instances, the operation was done on a paralytic leg, due to poliomyelitis. The tibia and fibula in such legs are already very small and are drawn out into still smaller diameter after surgery, hence, the necessity for a longer period of immobilization.

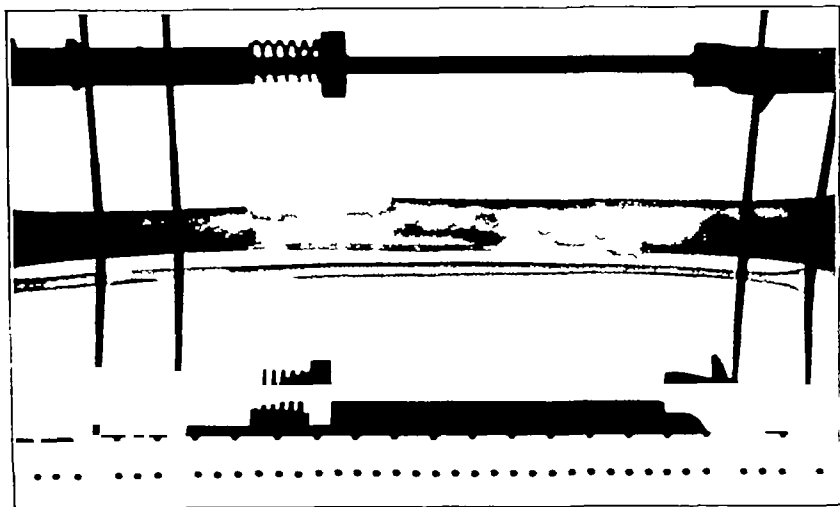


FIG 3

Case 3665 September 28, 1933 Six weeks after operation.

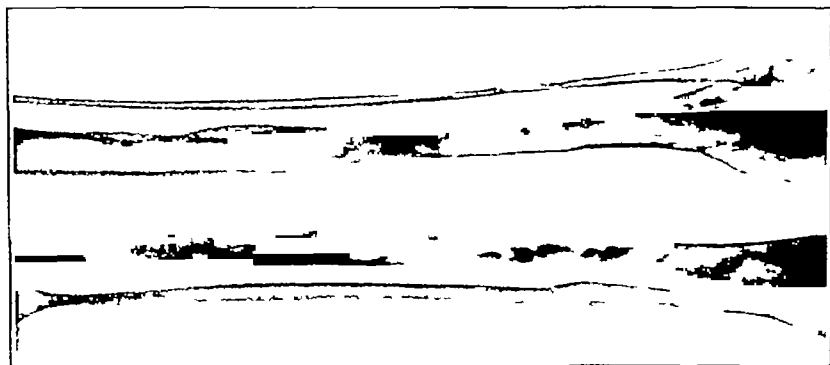


FIG 4

Case 3665 July 20, 1934 Eleven months after operation

The average postoperative time to the present is two and one-fifth years

The following points noted in the study of this series seem to the author to be of sufficient practical importance to warrant their recording.

In the first place, it is necessary to measure carefully both legs in advance and to know definitely how much lengthening one wishes to obtain. Several factors must be taken into consideration here. Especially in cases of poliomyelitis, it is important to know if there is a fixed pelvic obliquity, and, if so, how much. Also, it is necessary to know if this is a true fixed tilting of the pelvis or if it is of the type that can be corrected or improved by appropriate measures. If it is decided that the pelvic tilt is a fixed structural deformity that cannot be changed, this must

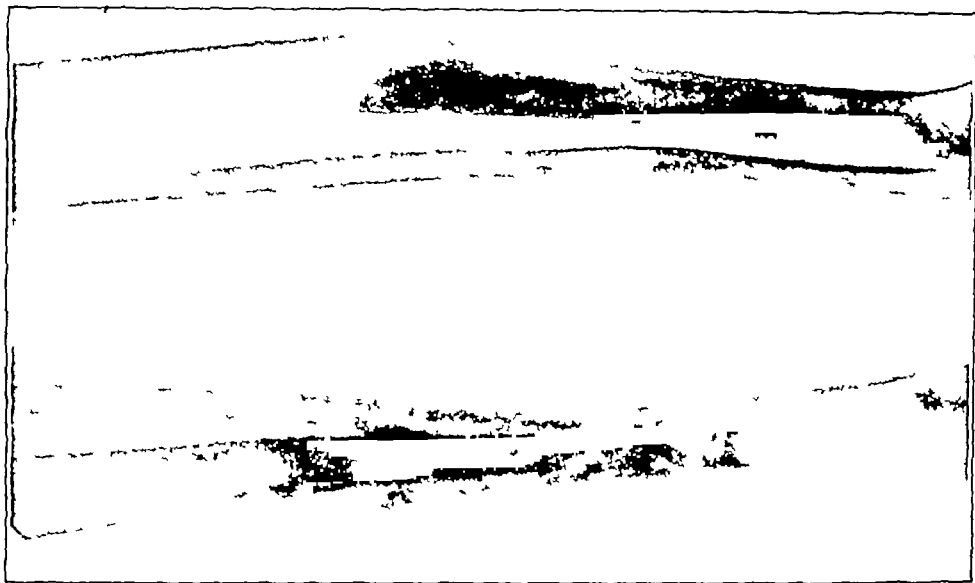


FIG 5

Case 1506 August 12, 1932 Ten months after operation

be taken into account before deciding how much the leg is to be lengthened. For example, if the leg is actually four inches short and the pelvis is tilted downward two inches on this side, then, obviously, the leg should not be lengthened more than two inches.

In two cases in this series, there was a tilt of the pelvis which was thought to be of such long duration that no improvement could be made. Later, as a result of treatment and upward thrust of walking on a longer leg, the obliquity of the pelvis improved so that the final result was a leg that was not long enough to balance the pelvis, making it necessary for a raised shoe to be worn on the leg which was operated upon. The lesson to be learned here is that an attempt should be made to correct the pelvic tilt before the leg-lengthening operation is done.

Another thing that must be taken into consideration when measuring the leg is the position or attitude of the foot. If there is a fixed equinus deformity of the foot, and this applies especially to the foot on which an

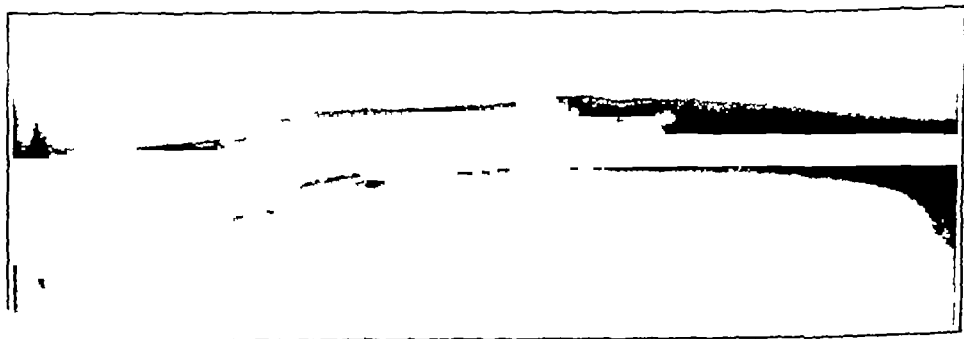


FIG 6

Case 2472 May 5, 1933 Thirteen months after operation

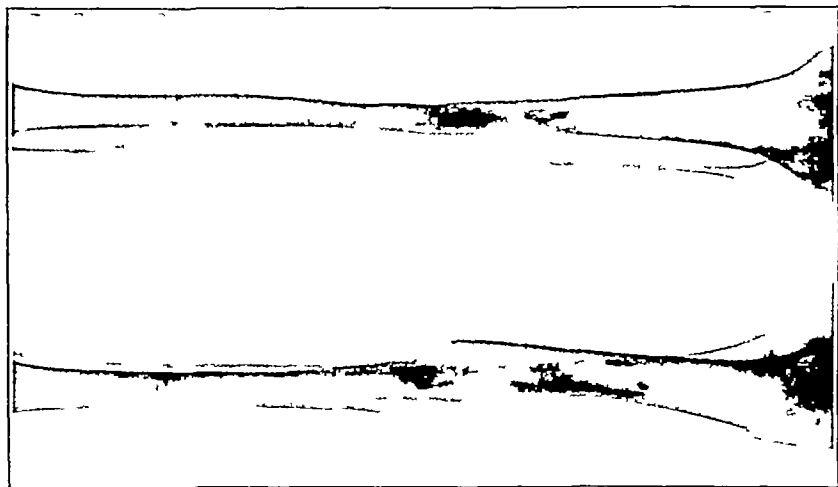


FIG 7

Case 4109 July 29, 1932 Ten months after operation

astragalectomy has been performed, it must be remembered that this deformity of the foot adds length to the leg. When measuring a short leg with this type of foot, a board should be placed under the forefoot at right angles to the leg. The amount of lengthening to be obtained is estimated by measuring the distance between the board and the heel and deducting from this the height of the heel to be worn on the opposite foot, this amount is then deducted from the difference in length of the legs.

A leg that is severely paralyzed from poliomyelitis should not be lengthened to equal the length of the opposite leg. A child with a very weak hip walks better if the leg is a little short,—a half an inch, at least.

One child in this series had a gait that was much worse after the leg-lengthening operation because the paralyzed leg was made the same

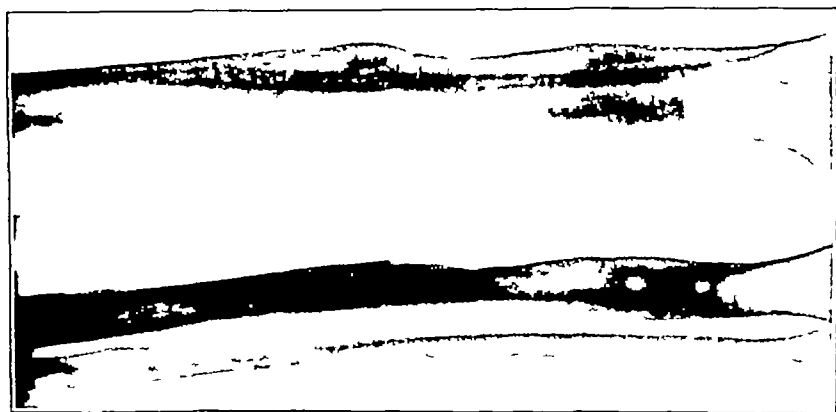


FIG 8

Case 11607 July 10, 1934 Nine months after operation.

length as the well leg. It is mechanically easier for the accessory trunk muscles to lift a paralyzed foot from the ground if the leg is a little short.

On the whole, very gratifying results have been obtained by this operation, and it is now a routine procedure. In most cases there has been obtained the amount of lengthening planned upon, at the same time good alignment of the leg has been maintained, with sufficient callus formation.

Naturally, there have been a few poor results. A brief account of these cases is included in the hope that this experience may be of benefit to others.

In one boy, a hemiectomeliac, the head of the fibula was dislocated downward almost two inches as a result of the traction, in spite of the fact that none of the pins entered the fibula and the bone was completely osteotomized. It is now almost three years since the operation, and, while there has been no change in position of the head of the fibula, there has been no pain or instability of the knee.

Another boy fell out of his wheel chair shortly after his operation and fractured the proximal tongue of the tibia at its base, making it necessary to stop the traction after one-half an inch of lengthening had been obtained. Now, when the patient is permitted to be out of bed, the author uses a special cart, built low to the ground and long enough to support the patient and the apparatus.

In one girl, a similar accident occurred at surgery. The fracture of the tongue was not complete and it was decided to go ahead cautiously with the traction. A distinct separation of the tongue from the main proximal fragment occurred, with marked tilting of the tongue, so that it was necessary to stop the traction when only a half inch of lengthening had been obtained. Unfortunately, this happened in the case of an adult whose leg bones were not much bigger than the fingers. Callus formation was extremely slow, and it was two and one-half years before this patient was allowed full weight-bearing, and it was thought that there would be non-union.

In one case, the lower of the two proximal pins through the tibia was unknowingly passed through the distal fibular fragment. The screws were turned up on the side bars, but x-rays revealed that no distraction was taking place. It was then discovered where the fault was, and new pins were applied. A definite osteomyelitis developed and only one inch of lengthening was obtained. It was two years before the patient was walking with full weight-bearing.

There was one case in which the fibula was not completely osteotomized. A secondary osteotomy was done three and one-half weeks later. Considerable drainage developed and the pins were removed early, which resulted in a loss of about half of the lengthening which was obtained at the time of the operation.

In the case just described and in four others, one end of the tibial tongue protruded through the skin. In two of these cases, the protruding

bone was removed surgically, in the others, no attention was paid to the exposed bone. In these latter cases, the exposed bone eventually became a sequestrum and discharged itself, and soon afterward the wound healed. The author believes that in the end better results are obtained by letting nature slough away the bone instead of doing a surgical removal of the protruding bone.

In two cases, the proper lengthening was obtained and the traction

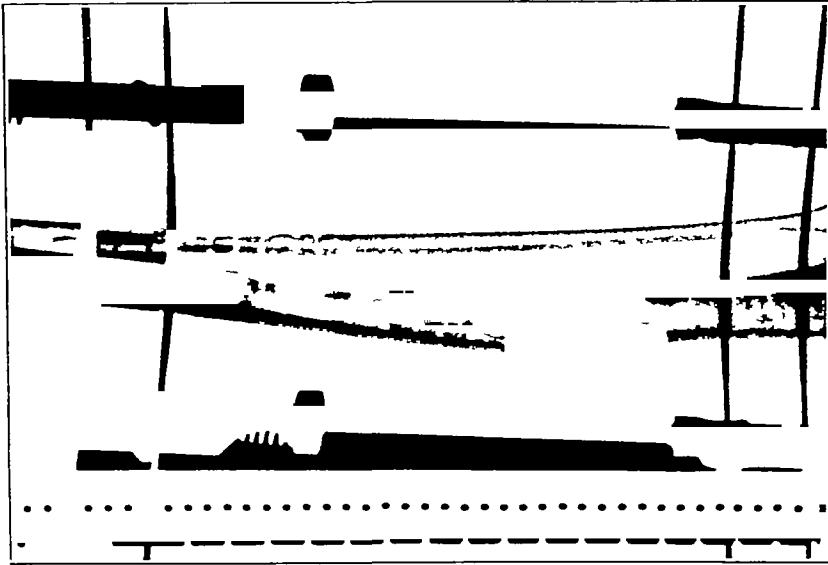


FIG 9

Case 125S5 June 9, 1933 Five weeks after operation.

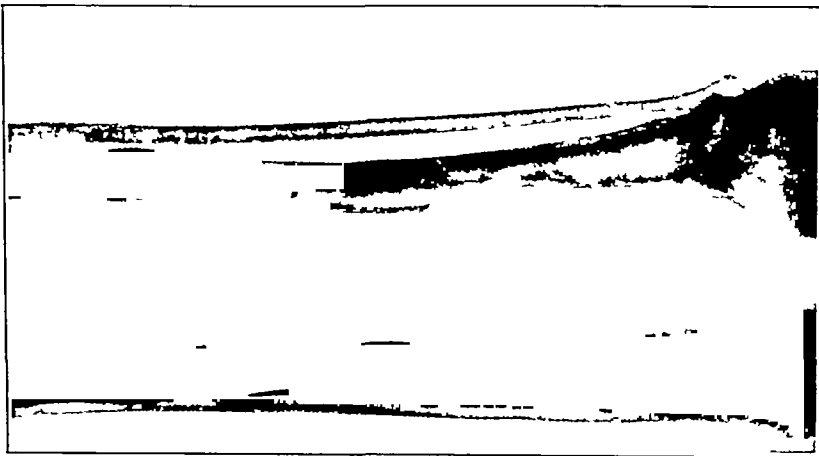


FIG 10

Case 125S5 November 23, 1934 Eighteen months after operation

was stopped. Later x-rays showed that an additional half inch of lengthening had occurred, due to the spring tension on the pins working against paralyzed muscles. Fortunately, not much callus had been laid down and it was possible to regain the proper lengthening by slacking off on the screws. Now care is taken to set the counter screws so that this continued lengthening cannot occur.

Usually callus formation is quite slow, especially in cases of poliomyelitis, but, in one patient with a short leg as a result of tuberculosis of the hip, callus was laid down with amazing rapidity, so that only one inch of lengthening could be obtained. Hence, it is necessary to check the progress by frequent x-rays and, if an undue amount of callus is evident, the traction process can be speeded up.

In this operation, particularly when it is done below the knee, there is a tendency toward anterior bowing of the tibia, due to the bow-string force of the soft tissues of the calf. Lately, in a few instances, the author has used one off-center pin to overcome this tendency, and it seems to be a worth-while procedure. Figure 1 shows the second pin from the proximal end set at a level slightly more anterior than the other three pins. Now, when the side bars are attached, there is a continuous posterior thrust of this off-center pin which counteracts anterior bowing. When the pins are set in this fashion, the osteotomy in the tibia should be performed in such a manner that the tongue of the proximal fragment is anterior to the distal fragment. A study of Figure 1 will plainly show the reason for this.

When setting all the pins in the same plane, it is better to make the tibial osteotomy so that the tongue of the distal fragment lies anterior to the proximal fragment. (See Figure 4.) Now, if anterior bowing occurs, one of the lower pins can be removed, and, if a sling is placed under the padded heel and attached to the side bars, the heel can be lifted up, the remaining lower pin is used as a fulcrum to correct the bowing. If the deformity is not severe, some correction can be obtained by using the same method, but without removing any pins.

It would be very instructive if statistics on a number of cases from various clinics were available in order that it might be determined, after a leg is lengthened in a growing child, whether or not the leg which has been operated upon maintains a rate of growth equal to the well leg. Also it would be interesting to know if additional lengthening occasionally takes place later as a result of traumatic stimulation to the bone due to the surgery. In a child in whom a tibial graft has been removed it is not uncommon to find later that the leg is one-fourth to one-half an inch longer than the opposite leg.

The only way that this problem can be accurately studied is to have serial full-leg x-rays of both legs taken at a distance of six feet so that accurate comparative measurements can be studied. This was not done in the author's series, but, by clinical measurement, it has been found that the leg which has been operated upon has equalled in growth the opposite leg in all cases except two. However, a longer time must be permitted to

elapse before the final answer can be given. While the first patient was operated upon five and one-half years ago, the average postoperative time is only two and one-fifth years.

The leg of one girl of twelve years, with complete flaccid paralysis below the knee, was lengthened one and one-half inches, making it the same length as the non-paralyzed leg. The patient was of the tall type and after operation she grew very rapidly. Nineteen months later the leg which had been lengthened was again one inch short.

The leg of another girl of fifteen years, who was of the tall, lithe type, was lengthened two and one-fourth inches, which made this leg only one-fourth of an inch shorter than the opposite leg. Eighteen months later the leg which had been operated upon was three-fourths of an inch short.

In no case, following surgery, has the leg increased in length over the well leg.

RESULTS FOLLOWING TENOSUSPENSION OPERATIONS FOR HABITUAL DISLOCATION OF THE SHOULDER *

BY MELVIN S HENDERSON, M D , ROCHESTER, MINNESOTA

Section on Orthopaedic Surgery, The Mayo Clinic

Because of unsatisfactory results following capsulorrhaphy and Clairomont's muscle-sling operation at The Mayo Clinic, for more than ten years we have used the tenosuspension operation for recurrent dislocations of the shoulder. This paper deals with our experience with tenosuspension operations. We have performed sixty operations for recurrent dislocation of the shoulder (Table I). Twenty-nine of these operations done on twenty-seven patients have been the tenosuspension operation, twenty-six operations (89.6 per cent of the operations) to date have been successful in preventing further dislocations, while three (10.4 per cent) did not prevent them (Table II). Two of the three patients whose operations did not prevent further trouble have had but one subsequent

TABLE I
RESULTS OF SIXTY OPERATIONS FOR HABITUAL DISLOCATION OF THE SHOULDER

Type of Operation	Number	Cures Effected		Number of Recurrences	
		Number	Per Cent	Improved	Failure
Capsulorrhaphy	19				
Anterior	16	6	37.5	4	6
Posterior	3	3			
Clairomont	8	4	50.0	1	3
Young	2				2
Excision of head	1	1			
Nicola	1	1			
Tenosuspension	29	26	89.6	2	1
Total	60	41		7	12

dislocation and consider themselves very much improved. There have been no deaths, infections, or other unfavorable complications. The average ages of the patients, their sex, and the incidence of epilepsy are shown in Table III. The majority of our patients were males and were in the active period of life.

In reviewing the records of these patients we attempted to classify what the patients considered the chief factor, or cause, in the occurrence of the dislocations. About half, or thirteen, ascribed the initial disloca-

* Read before the Meeting of the American Orthopaedic Association, Philadelphia, Pennsylvania, June 7, 1935.

TABLE II

TENOSUSPENSION OPERATION FOR RECURRENT DISLOCATION OF SHOULDER

Number of cases	27
Number of operations	29
Results of operations	
Excellent (89.6 per cent)	26
Failure (10.4 per cent)	3
Infection	0

TABLE III

PATIENTS IN WHOM THE TENOSUSPENSION OPERATION WAS PERFORMED FOR RECURRENT DISLOCATION OF SHOULDER

Average Ages of Patients, Sex, and Incidence of Epilepsy	Patients	
	Number	Per Cent
20 to 30 years	17	63.0
30 to 40 years	7	25.9
17 to 20 years	2	7.4
More than 40 years	1	3.7
Males	20	74.0
Females	7	26.0
Epileptics (2 females 3 males)	5	18.5

TABLE IV

TYPE OF INJURY FOR WHICH TENOSUSPENSION OPERATION WAS USED

Associated with fall	13
Associated with athletics	11
Boxing (both shoulders in one case)	4
Spontaneous	5
Definite changes in joint (x-ray)	6
Previous operation	3

tion to direct injury, such as a fall, wherein one might reasonably expect a normal shoulder to become dislocated. Eleven patients stated that the initial dislocation occurred in the course of some athletic activity. Five said the first dislocation was spontaneous and could assign no definite cause for it. Apparently there is a certain percentage of shoulders that are inherently unstable. Roentgenographic examination failed to demonstrate any appreciable abnormalities, except in those shoulders which had been dislocated a great many times, and the changes that were to be seen in those could be attributed to the repeated trauma incident to dislocation and reduction. Some patients had suffered more than 100 dislocations. Three of the patients had been operated on previously (Table IV).

TABLE V

PERIOD OF RECURRENT DISLOCATION OF SHOULDER PRECEDING TENOSUSPENSION
OPERATION

Duration of recurrent dislocations	
Average	5 3 years
Longest	20 0 years
Shortest	6 0 months
Number of dislocations	
Average	21
Greatest	113
Least	2
More than twenty	17
Dislocation of both shoulders	
Bilateral operations	2
Unilateral operation	1

The time elapsing between the first dislocation and the date of operation, as well as the number of dislocations, varied greatly. The average time was five and three-tenths years. The average number of dislocations reported by the patients was twenty-one. Dislocation of both shoulders was present in three cases, two of these patients had both

TABLE VI

PERIODS SINCE TENOSUSPENSION OPERATION FOR RECURRENT DISLOCATION OF
SHOULDER

(First Operation, June 12, 1924)

More than five years since tenosuspension	
Number	14
Excellent results	12
Failure (1 epileptic)	2
More than three years since tenosuspension	
Number	3
Excellent results	2
Failure (epileptic)	1
More than eighteen months since tenosuspension	
Number	5
Excellent results	5
Less than eighteen months since tenosuspension	
Number	7
Excellent results *	7

* Patients recently traced

TABLE VII
SUMMARY OF CASES

(no)	Age (years)	Sex	Occupation	Number of Dislocations Before Operation	Shoulders Affected	Date of Operation	Time Since Operation	Remarks	Results Since Operation
1	31	M	None	30	Left	0-12-21	11 years	Epileptic patient Previous operations	No dislocations
2	33	F	Housewife	32	Left	1-30-25	10 years		No dislocations
3	32	F	Housewife	12	Right	0-11-25	9 years		No dislocations
4	26	M	Tool dresser	15	Left	8-19-20	8 years		No dislocations
5	23	M	Student	Many (?)	Right	1-5-27	8 years		No dislocations
6	22	M	Prize fighter	7	Both	1-0-28	7 years		No dislocations
7	30	F	Dictionian	Many (?)	Right	8-11-28	6 years		No dislocations
8	23	M	Machinist	15	Left	12-0-28	6 years		No dislocations
9	17	F	Sister of Charley	10	Right	9-15-20	5 years		No dislocations
10	26	M	Cabinet maker	9	Right	10-1-20	5 years		No dislocations
11	30	M	Oil driller	20	Left	3-0-30	5 years		No dislocations
12	26	F	Interior decorator	22	Left	3-12-30	5 years	Epileptic patient	Failure
13	24	M	Student	12	Right	0-12-30	5 years		Improved
14	21	M	Labourer	2	Right	0-28-30	5 years		No dislocations
15	20	M	Student	25	Right	10-17-31	3 years	Epileptic patient Previous operation	Improved
16	21	M	Student	113	Right	11-17-31	3 years		No dislocations
17	30	M	Drumist	20	Left	12-7-31	3 years		No dislocations
18	27	M	Timekeeper	30	Left	0-8-33	2 years		No dislocations
19	26	F	Housework	Many (?)	Right	11-28-33	18 months		No dislocations
20	50	M	Miner	Right 1 Left 2	Both	1-13-31 2-0-31	18 months		No dislocations
21	18	M	Student	10	Left	3-21-31	15 months		No dislocations
22	24	M	None	10	Right	0-20-31	1 year		No dislocations
23	17	M	Student	5	Left	8-1-31	10 months		No dislocations
24	20	M	Rancher	30	Right	12-5-31	6 months		No dislocations
25	21	M	Drugstore clerk	5 a day	Left	1-18-35	6 months	Epileptic patient	No dislocations
26	23	M	Student	Many	Both	1-28-35 2-11-35	5 months	Latent syphilis	No dislocations
27	20	F	Student	20	Left	5-8-35	1 month		No dislocations

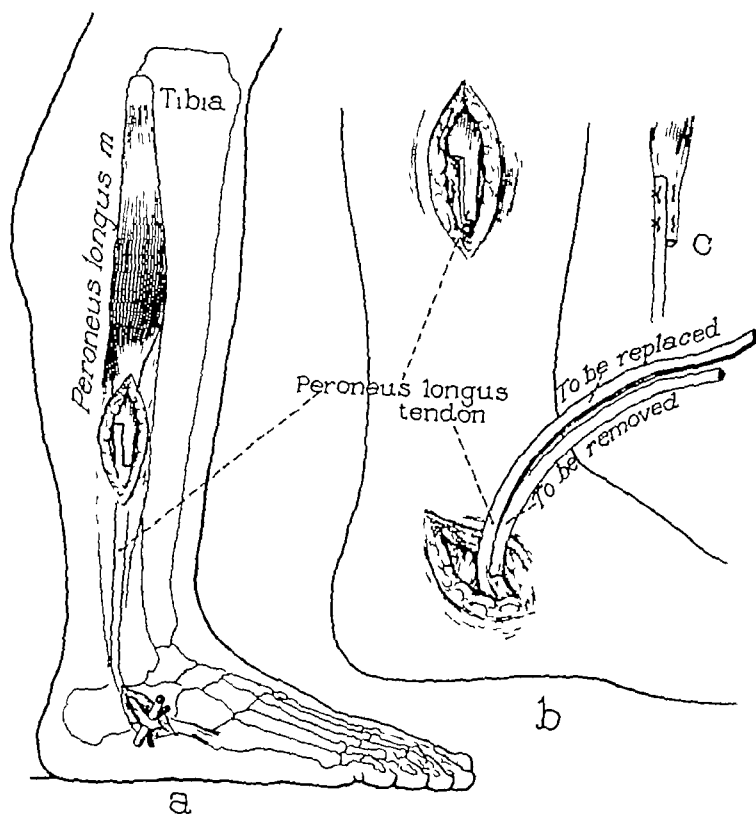


FIG 1

Method of removing one-half thickness, of proper length, from peroneus longus tendon to make a new suspensory ligament

done only one of these operations. Although I have been tempted to do more, and thus to try it out further, I have felt almost duty-bound to continue using our tenosuspension operation and to collect data on a sufficiently large number of cases to prove the soundness of the principle underlying this operation, and its usefulness.

The number of operations for recurrent dislocation of the shoulder that are done in any one clinic is usually not very great when compared with the number of operations done for other conditions. Our number of cases has gradually increased, until I believe we now have data sufficient to prove that tenosuspension gives excellent results in a large percentage of cases. Any objection raised against use of the peroneus longus tendon can be answered by the fact that a patient uses the leg in a week, and athletes have carried on their activities with no sense of loss. Two small incisions suffice for removal of the tendon (Fig 1).

TECHNIQUE OF OPERATION

The technique of the tenosuspension operation is simple and has been described previously.¹ The peroneus longus tendon is used in preference to fascia lata, for this tendon is easily obtained, and is strong, suitable material for the making of a new ligament. We have lately simplified the technique somewhat by drilling a Kirschner wire through

shoulders operated upon, but in the other case only one was operated upon because the other shoulder was giving so little trouble (Table V).

In this paper no attempt is made to cover the literature, for this has been done in my previous contributions and by many others.

In recent years Nicola, of New York, has advocated an operation in which the proximal end of the biceps tendon is used as a suspensory ligament. I have

the acromion process and through the head of the humerus, and threading over this wire a drill just large enough to make a snug fit for the peroneus longus tendon (Fig 2). If the drill hole is too large, the tendon may fail to grow fast to the bone. The failures that we have had, I believe, were attributable to technical errors, such as the piece of peroneus longus tendon being too short to permit the making of a complete loop, or having the drill holes so large that the ten-

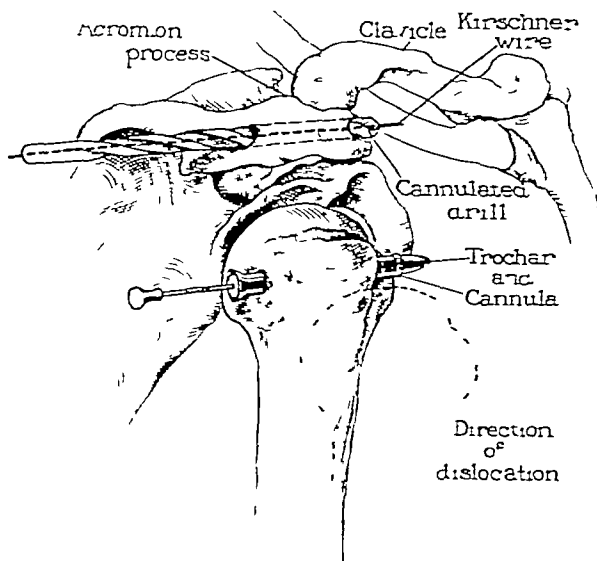


FIG 2

Kirschner wire through acromion process used as a guide for the cannulated drill. Trochar and cannula *in situ* in drill hole in humerus, facilitating the drawing of the tendon through the channel prepared for it.

dendon glided in the bone and wore until it broke. I believe that if all the technical requirements can be fulfilled, if the arm can be held to the side long enough (about three weeks), if patients subject to epilepsy can be prevented from having seizures for the same length of time, and if abduction and rotation beyond a third of normal range can be prevented for three months, cure is practically certain.

RESULTS

In fourteen cases more than five years have elapsed since the tenosuspension operation, twelve patients have had no recurrences of the dislocation, and two have had recurrences. More than three years have elapsed since the tenosuspension operation was done in three other cases, one of these patients has had recurrence of the dislocation. In five cases more than eighteen months have elapsed since the tenosuspension operation and none of the patients, so far, have had any recurrence. In seven cases less than eighteen months have elapsed since the operation and no recurrences have occurred (Table VI). Function following tenosuspension is excellent, practically full abduction, with elevation to normal height over the head, has been obtained.

A summary of the series, case by case, is given in Table VII.

REFERENCE

1. HENDERSON, M. S. Habitual Dislocation of the Shoulder. J. Am. Med. Assn. *CV*, 1653. 1930.

OPERATIVE CORRECTION OF GENU RECURVATUM

BY A L BRETT, M D , BOSTON, MASSACHUSETTS

In a case of genu recurvatum, due to anatomical malformation of the anterior weight-bearing surface of the tibia, the writer has restored a normal joint by operative correction of the deformity. The technique used was similar to that suggested by Lexer¹ in 1931, but the writer was unacquainted with Lexer's work at the time of using this operative measure.

CASE REPORT

The patient, A. D., at the age of twelve, had suffered a severe attack of poliomyelitis. The residual paralysis was widely distributed and involved the back muscles, the foot muscles, and the hamstrings and quadriceps of the right leg.

The patient had been treated intermittently for her back and feet over a period of twenty-one years before she presented herself to the writer. Her immediate complaints were pain, weakness, and hyperextension of the right knee, which caused her to fall frequently. She walked with the aid of crutches and experienced almost constant pain.

Examination showed that when weight was borne upon the leg the knee joint hyperextended 30 degrees. Roentgenographic examination revealed a slight downward sloping of the anterior surface of the tibia, some flattening of the condylar surfaces of the femur, and a definite cupping out of the tibial surface (Fig. 1).

Technique of Operation

On May 25, 1934, an operation to elevate the tibial surface was performed according to the following technique.

First, the lateral stability of the joint was assured.

The knee was placed in 90 degrees of flexion. A curved skin incision was made, beginning just above the inner condyle, crossing the patellar tendon just above the tibial tubercle, without severing it, and terminating at a point on the outer condyle opposite the starting point. The flap of skin was dissected upward. An incision was made on each side of the patellar tendon and running parallel to it, in order to allow for retraction of the tendon to either side when osteotomy of the tibia was carried out.

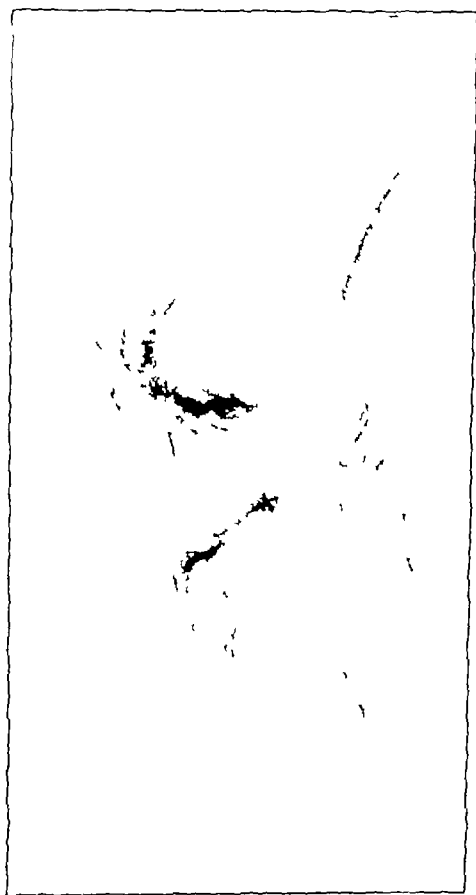


FIG 1

Case A. D. Roentgenogram, before operation, showing downward sloping of the anterior surface of the tibia, flattening of the condylar surfaces of the femur, and cupping out of the menisci. The knee locks at about 30 degrees beyond the normally extended position.

With a thin osteotome, an incomplete osteotomy of the tibia was carried out just below the capsular attachment. Care was taken to cut the cortex along the entire front and sides of the bone. The anterior surface of the tibia was elevated, and the posterior cortical surface was left to act as a hinge. Into the gap thus formed were forcibly pushed numerous bone chips. (See Figures 2-A and 2-B.) (In this particular case, because of a lack of sufficient bone chips, bone screws were also included to provide additional support.)

The wound was sutured in layers, and a plaster-of-Paris cast was applied, extending from the toes to the groin, with the knee in 180 degrees of extension or slightly flexed.

The after-care consisted of baking and massage, which were begun six weeks after the operation.

Result

By the first of August 1934, two months after the operation, the knee was perfectly stable and had free flexion beyond the right angle. There was no hyperextension on weight-bearing or under force, and no pain. Roentgenograms (Figs 3-A and 3-B) showed a corrected weight-bearing surface.

In May 1935, one year after the operation, when the patient was last seen, the result was most satisfactory (Fig 4). Under weight-bearing, there had been no indication of

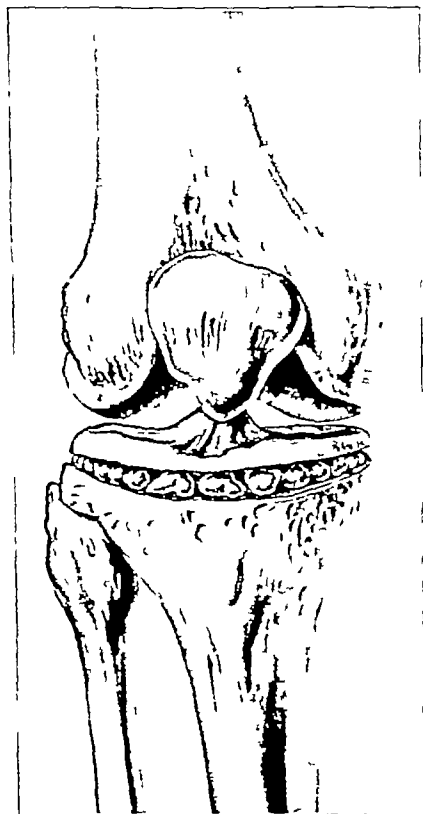


FIG 2-A

Anteroposterior view of elevation of the tibial joint surface with bone chip introduced in the wedge-shaped gap

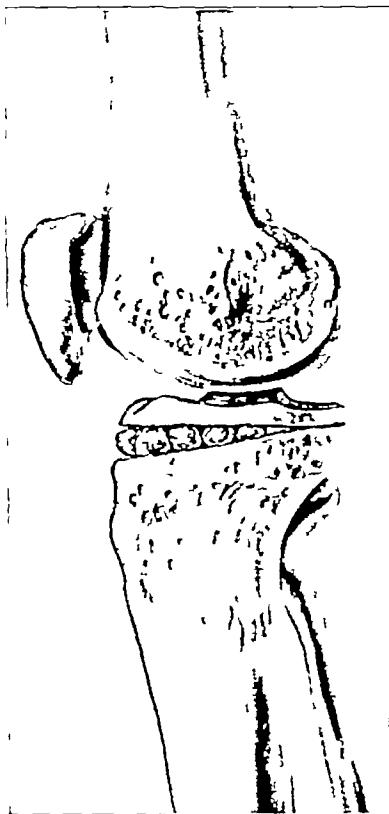


FIG 2-B

Lateral view showing the anterior hinge

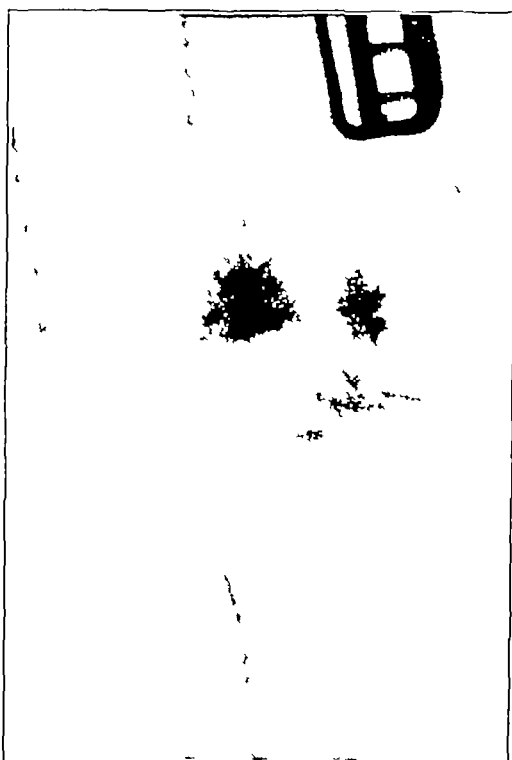


FIG 3-A

Case A D Roentgenogram, with the leg in the plaster cast two months after operation, showing the line of osteotomy under the entire articular tibial surface

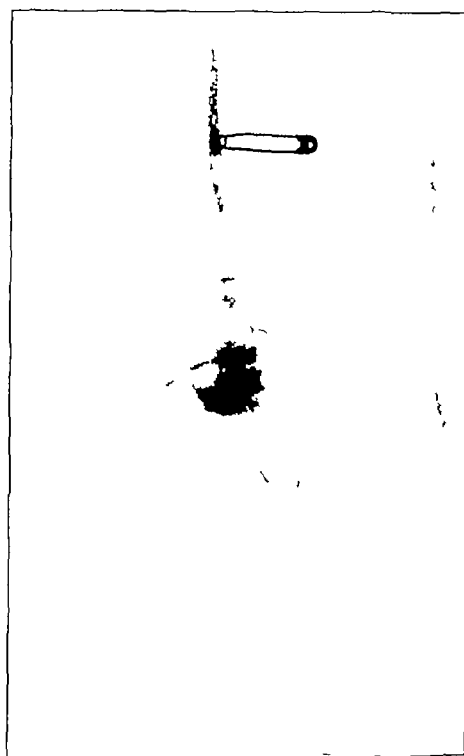


FIG 3-B

Case A D Lateral view showing the posterior hinge and the elevation (about three-eighths of an inch) of the anterior tibial surface

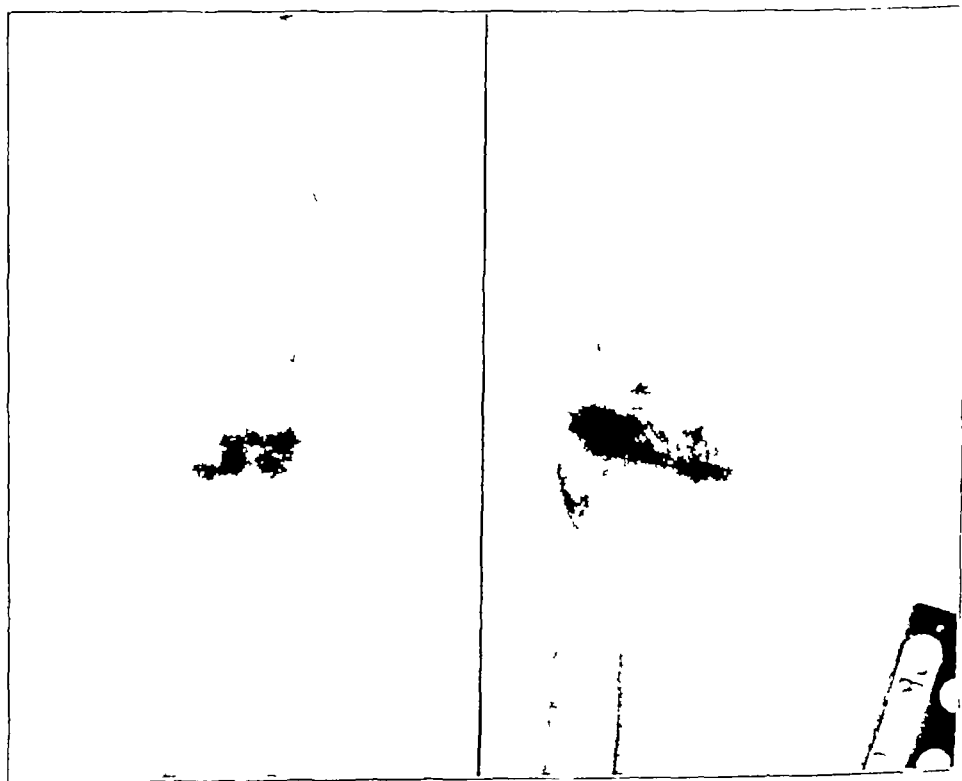


FIG 4

Case A D Anteroposterior and lateral roentgenograms, taken one year after operation, with the knee normally extended and in the weight-bearing position

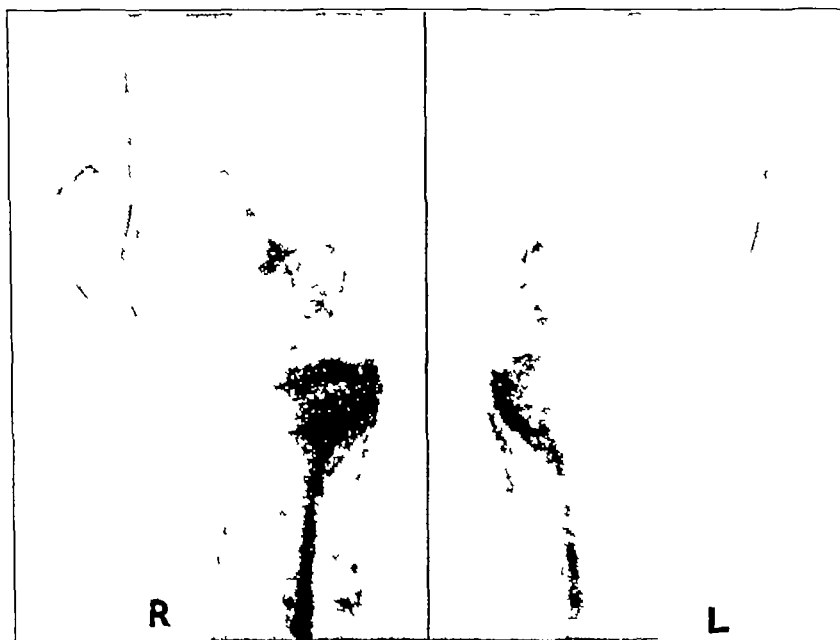


FIG 5-A

Case D C Bilateral genu recurvatum Roentgenograms, taken with the knees straight, showing the anatomical and structural downward sloping of the weight-bearing surfaces of the tibiae and the forward position of the femoral condyles



FIG 5-B

Case D C Views of the knees in the hyperextended position, showing the necessary squaring of the tibial surfaces and their relation to the femoral condyles when the joints are locked

recurrence, and the knee locked in the extended position. The joint was not painful when forced. Slight power had returned in the quadriceps. The patient had returned to her work as a clerk in a store.

DISCUSSION

This case is presented not only to describe a successful correction of a hyperextended knee, but also to focus attention upon the malformation of the joint surfaces of the tibia and femur as the cause of genu recurvatum. The writer has under observation a number of cases of sloping of the tibial surface. One interesting case, which is bilateral, was due to the limbs being held in continuous hyperextension while the patient was being treated on a frame for a lesion of the spine in childhood. (See Figures 5-A, 5-B, 6-A, and 6-B.)

Malformation of this nature in the anterior surface of the tibia is undoubtedly due to an arrest of development centered in the diaphysis. No abnormality has been observed in the epiphysis. One of several factors may be responsible for the lack of growth in the diaphysis. It may well be idiopathic in origin in that a person may inherit a predisposition to the deformity, based upon an arrest of development in that part of the skeleton. It may also be symptomatic in origin, occurring as the result of unequal pressure following disease, trauma, or a disturbance of statics. The most important factor is a disturbance of statics,—that is, a deflection of the normal weight-bearing line, which creates an unequal pressure in the tibial diaphysis.

When downward inclination of the tibial surface is marked, locking

of the knee joint, with the tibia and femur in the extended position, is impossible. When standing erect, the person with such a knee must assume a position similar to that adopted when standing on the slope of a hill. Under the strain, the posterior ligamentous and capsular structures easily become stretched. When such changes have occurred, a person is genuinely handicapped, for locomotion is difficult and usually painful.

The operative method by which equilibrium and function may be restored is applicable both to cases in which deformity is present in the tibia and to cases in which there is deformity in the lower diaphyseal end of the femur. In the latter case, the anterior

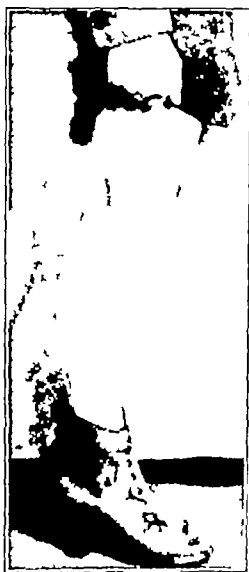


FIG 6-A

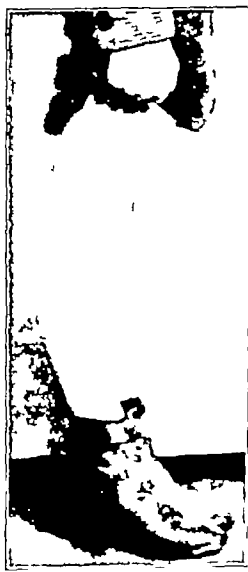


FIG 6-B

Fig 6-A Case D C Photograph of patient holding knees in straight position by exerting great muscular effort.

Fig 6-B Case D C Patient standing with the knees relaxed and in hyperextension,—the only position in which the knees lock.

surface of the tibia is raised until it lies in contact with the flattened femoral condyles

The successful use of this operation in one case indicates that it may be considered for general application, and that it is especially adapted to cases of sloping of the tibial surface, such as that shown in Figure 5-A

1 LEXER, ERICH *Wiederherstellungschirurgie* 2 Aufl. Leipzig J. A. Barth, 1931

THE USE OF KIRSCHNER WIRE IN MAINTAINING REDUCTION OF FRACTURE-DISLOCATIONS OF THE ANKLE JOINT *

A REPORT OF TWO CASES

BY JOHN DIETERLE, M D , MILWAUKEE, WISCONSIN

The so called lipping or marginal fractures of the lower end of the tibia, with dislocation of the foot, often present considerable difficulties in reduction. To maintain reduction of the astragalus with reference to the lower articular surface of the tibia will tax the ingenuity of the surgeon. Lounsbury and Metz¹ are quoted as follows:

"The nearer the line of fracture is to the apex of the concavity of the tibial articulation, the easier it will be to reduce the astragalus and the

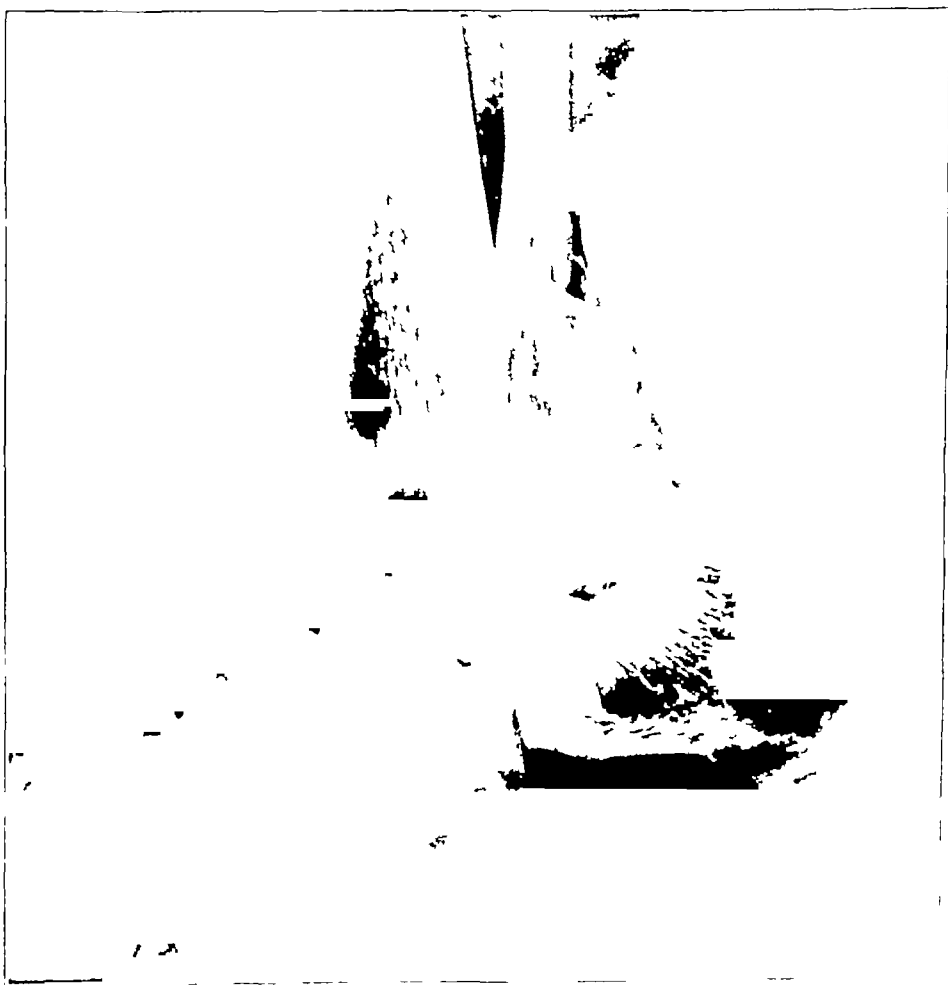


FIG 1

Case 1. Lateral view of ankle joint, showing fracture of the posterior lip of the tibia and fibula, with posterior displacement of the foot.

* Read at the Annual Meeting of the American Academy of Orthopaedic Surgeons, New York, N. Y., January 15, 1935.

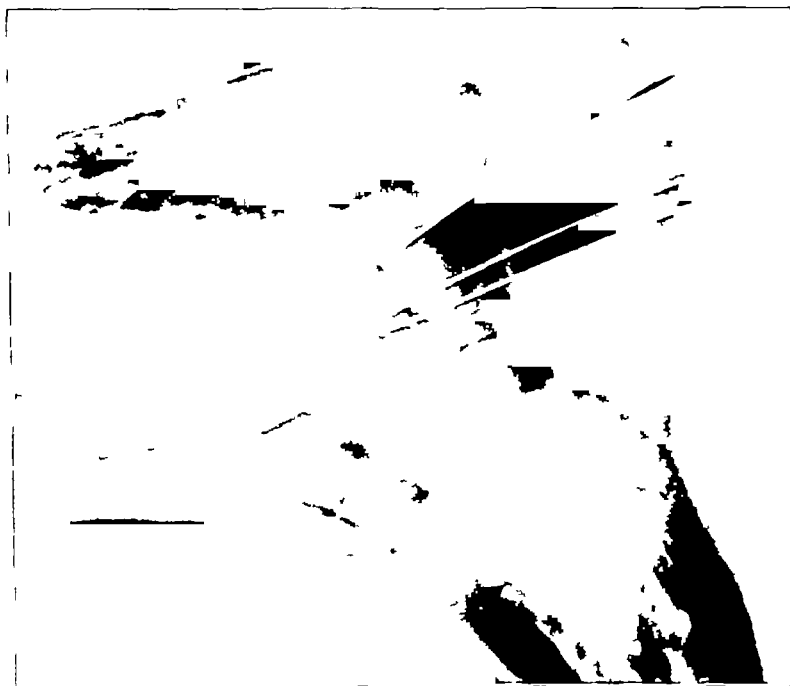


FIG. 3

Case 1. Lateral view, showing the wires *in situ* with plaster cast applied. Note wires projecting through the cast.

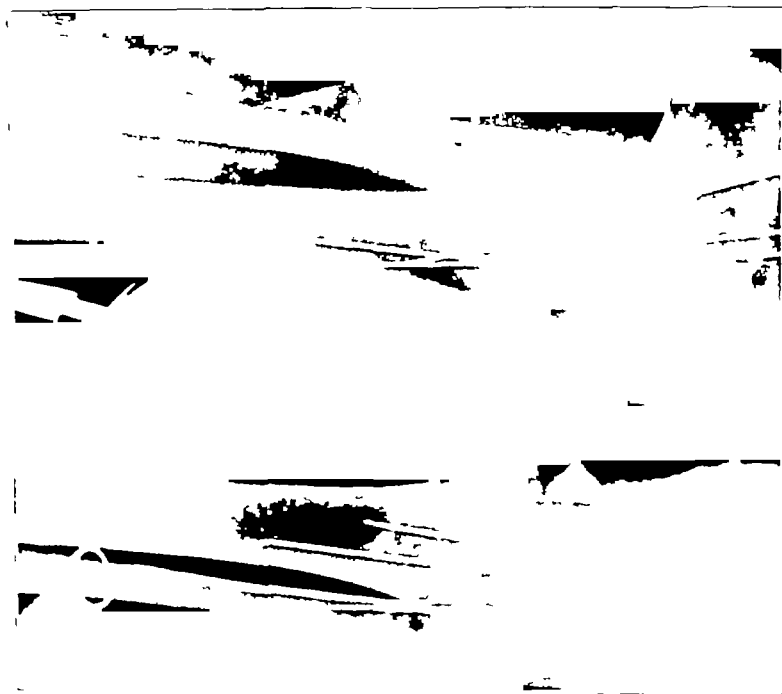


FIG. 2

Case 1. Anteroposterior and lateral views, showing reduction maintained by Kirschner wire drilled through the heel.



FIG 4

Case 1 Lateral view, taken six weeks after reduction, showing union, with fragments in good position

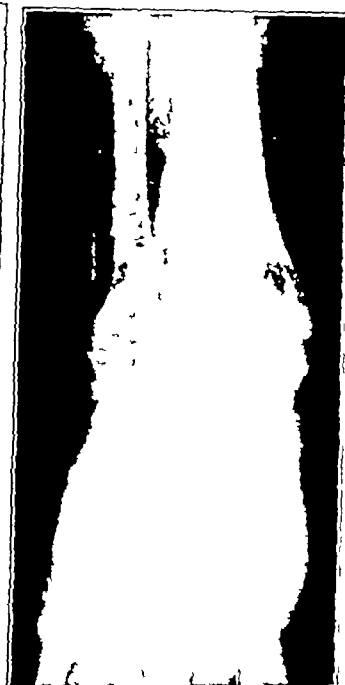


FIG 5

Case 1 Anteroposterior view, taken six weeks after reduction

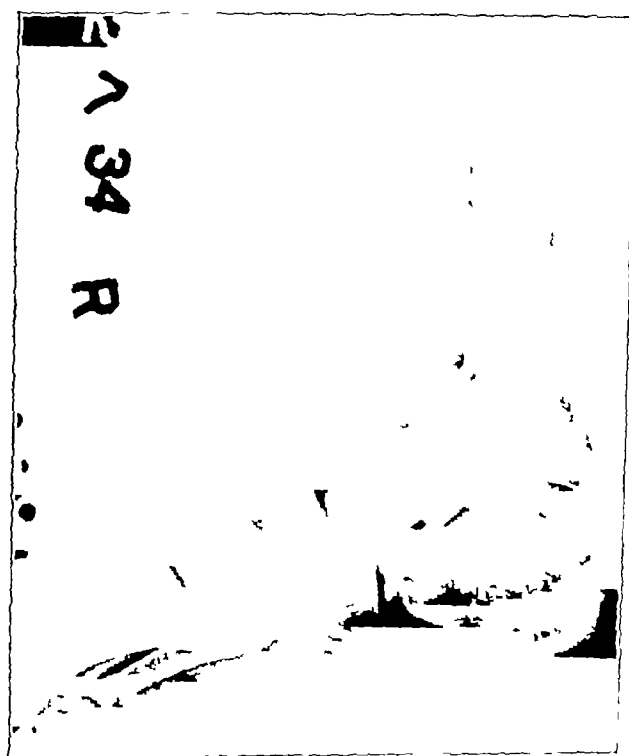


FIG 6

Case 2 Lateral view of ankle joint, showing comminuted fracture of the anterior lip of the tibia, with anterior displacement of the foot



FIG 7

Case 2 Anteroposterior view, showing fracture of the internal malleolus, with medial displacement of the foot

more difficult it will be to maintain it after reduction. Frequently, the surgeon has made an excellent reduction of such a fracture and applied a cast to maintain it. When checking the result with a roentgenogram, he has been disappointed to find that displacement has recurred within the cast, and, in spite of repeated efforts of non-operative methods, he has been unable to hold the fragments in their normal position. Under these circumstances, an open reduction and fixation of the fragments is the only method that will be effective."

The technique of this operation is described and illustrated and several case reports of new and late fractures are given.

An easy and effective way of maintaining reduction in fracture-dislocations of this variety is shown in the reports of the two cases which follow.

CASE 1 The patient presented a fracture of the posterior third of the lower articular surface of the tibia and of the lower end of the fibula, with posterior displacement of the foot (Fig. 1). Reduction had been attempted on two occasions by the application of unpadded plaster casts. Check-up x-rays showed that displacement had recurred within a few hours. The following procedure was then carried out:

While an assistant held the fragments in position by pulling on the forefoot and applying counterpressure on the lower shin, wires were drilled upward through the heel transfixing the calcaneum, astragalus, and tibia (Fig. 2). Reduction was satisfactorily



FIG. 8

Case 2. Lateral view showing reduction maintained with Kirschner wires and plaster cast.



FIG. 9

Case 2. Anteroposterior view showing reduction of the internal malleolus maintained with Kirschner wires which cross each other.

maintained. It was impossible to redislocate the foot by forcing it backward. A cast was then applied with the wires protruding through the plaster, as shown in Figure 3.

Figures 4 and 5 show the fractures united in good position six weeks after reduction when the wires and cast were removed. This patient has a good range of motion in the ankle joint and a good functional result.

CASE 2 This patient suffered a fracture of the anterior margin of the tibia and of the internal malleolus, with anterior and medial displacement of the foot (Figs. 6 and 7).

Reduction of this dislocation by manipulation was found to be impossible, and an open reduction was done, using Lounsbury's incision. The reduction was accomplished by pulling on a tractor attached to a wire drilled transversely through the posterior portion of the os calcis. While the reduction was maintained by an assistant, wires were drilled upward through the heel, transfixing the os calcis, astragalus, and tibia. The internal malleolus was then approximated to the shaft and held in place by wires drilled in at an angle and crossing one another, as shown in Figures 8 and 9. The wound was closed about the wires and a cast was applied. The wires were allowed to protrude through the plaster.

Subsequent x-rays showed the reduction to be satisfactorily maintained. The wires were extracted eight weeks after reduction and the cast was removed two weeks later, at which time there was good union (Fig. 10). This patient also has a good functional result.

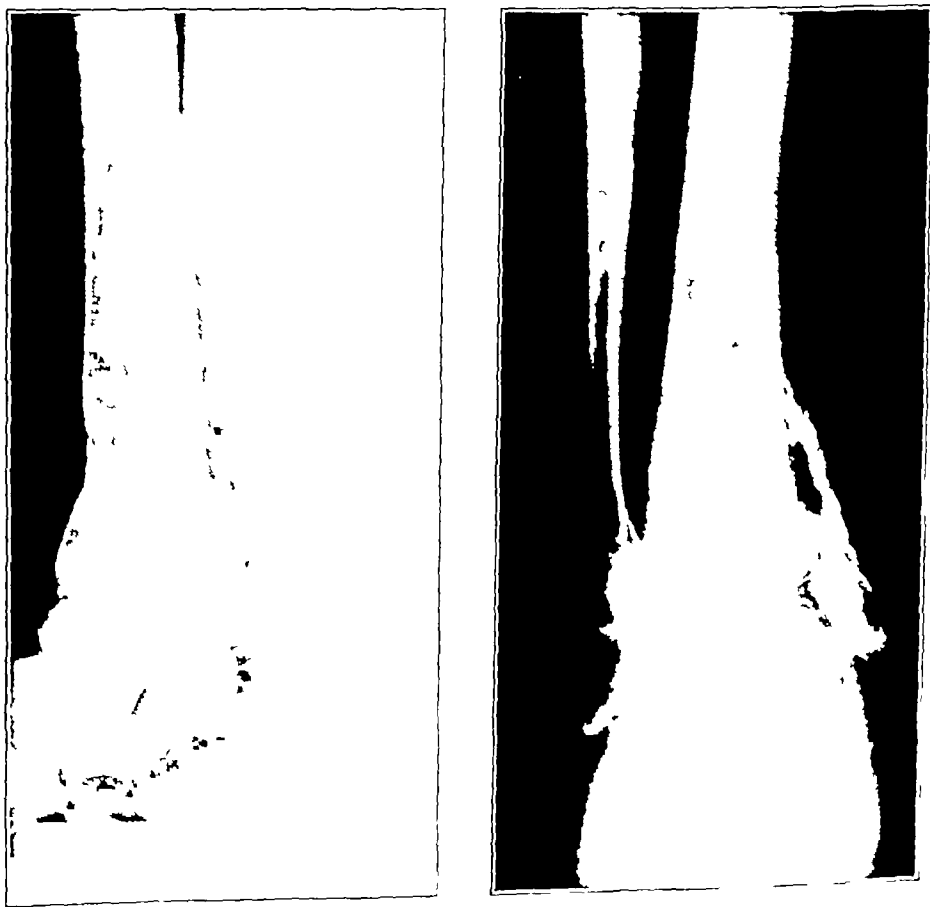


FIG 10

CASE 2 Anteroposterior and lateral views, two months after reduction, showing good union, with fragments in satisfactory position.

COMMENT

The result obtained in the first case shows that it is possible to maintain reduction in some cases without recourse to open operation. The advantage in the use of wire is obvious.

In the second case, the anterior tibial fragment was found to be comminuted, precluding any fixation with an autogenous graft, as described by Lounsbury. This patient, injured in a fall from a roof, also sustained multiple fractures of the left hand and of the lumbar transverse processes, and a compression fracture of the first lumbar vertebra. In view of these complications, the use of wire for the ankle injury considerably simplified the treatment.

The writer is indebted to Dr. J. R. Regan for the roentgenograms in the second case and for the management of the case, which was largely responsible for the result obtained.

1. LOUNSBURY, B. F., AND METZ, A. R. Lipping Fracture of Lower Articular End of Tibia. *Arch. Surg.*, V, 678, 1922.

OSTEODYSTROPHIA FIBROSA CYSTICA LOCALISATA*

BY DOCENT N. B. SHONARYEVITCH, KHARKOV, U. S. S. R.

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The author has had opportunity at the Orthopaedic and Traumatological Clinic of the Kharkov Medical Institute to observe for three years the clinical course of a case of osteodystrophia fibrosa cystica localisata. It does not frequently happen that an opportunity is presented to study over a long period the clinical course, including the repair, of this rather unusual condition, and, since the question of the etiology and diagnosis is not particularly well understood, the information obtained from a study of this case may be of value.

S. B. M., a boy, four years of age, was brought to the Clinic on January 10, 1930, because of a limp which had existed for two and one-half months. There was no complaint of pain. The child was of normal development, with nothing remarkable in regard to his general condition except that the lymph glands on both sides of the neck were slightly enlarged.

In the upper third of the right femur, there was evident a slight enlargement, measuring eight centimeters. At a little distance from the anterior-superior spine, the right hip measured thirty-one centimeters and the left twenty-nine and five-tenths centimeters. There was no increase in local temperature and no fluctuation or induration of the soft tissues. There was sensitiveness to deep pressure and also slight limitation of both active and passive flexion of the hip joint, but other movements were practically normal in extent and character. There was no inequality in length of the legs.

An x-ray, taken October 30, 1929, showed a cavity in the upper portion of the right femur, extending from the level of the lesser trochanter upward to within three millimeters of the epiphyseal cartilage. The walls of this cavity were extremely thin,—from two to three millimeters in thickness. In the center of the cavity, ascending laterally from the lesser trochanter, was a projection of bone about two millimeters in thickness. The appearance and the structure of the other parts of the hip were normal.

The x-ray (Fig. 1), taken three weeks later, showed some increase in the size of the cavity and some diminution in the thickness of its walls. The roentgenogram, taken January 10, 1930, the day on which the patient was admitted to the Clinic, showed still greater increase in the size of the cavity, which now extended from three millimeters below the lesser trochanter upward to the epiphyseal-cartilage line. The lateral walls were about one millimeter in thickness.

Examination of the blood on November 2, 1929, showed no important variation from the normal condition except that the hemoglobin had dropped to fifty-six per cent. An examination made on January 8, 1930, showed further change,—a decrease in the number of white blood corpuscles from 7,500 to 3,900, a decrease in the number of neutrophils from sixty-five per cent to forty and five-tenths per cent, and an increase in the number of lymphocytes from twenty-seven per cent to fifty-three per cent.

On account of the rapid growth of the lesion, the leg was placed in a plaster-of-Paris spica with a firm grip upon the pelvis. Until the middle of January, the child had apparently not experienced pain, but at that time he began to complain of severe pain, to cry practically night and day, and to show marked sensitiveness. It was feared that a fracture of the hip had occurred.

* Read at the Orthopaedic Section of the Kharkov Medical Society, February 10, 1930 and April 15, 1933.

On January 16, 1930, under general anaesthesia, a biopsy was performed through an opening two and five-tenths centimeters long on the lateral side of the hip, and two cubic centimeters of bloody fluid were removed for examination. The wound was closed and healed normally. The child, however, became profoundly affected both as to pain and as to his general condition.

Laboratory examination of the fluid removed showed it to be blood-red in color and muddy, with small compact bone-like particles. Microscopic examination showed bone tissue with fibrous residue, round-celled granulation tissue, accumulations of osteoblasts, giant polynuclear cells (osteoclasts), and precipitations of hemosiderin. Cultures gave no growth. The laboratory diagnosis (Prof. S. L. Ehrlich) was osteodystrophia fibrosa cystica localisata.

One month later, the x-ray showed that the lateral wall of the cavity was practically destroyed and that the middle wall also had a defect. On the upper border of the middle third of the cavity was noted a transverse line, suggesting the line of a pathological fracture. *Coxa vara* had practically occurred. Vertically, the upper portion of the cavity had somewhat decreased. A distinct atrophy of the head of the femur was noted.

On February 11, 1930, under general anaesthesia, an operation was performed by Prof. Tregubov. An opening was made into the cystic cavity and, under considerable pressure, there was evacuated about twenty cubic centimeters of a dark bloody fluid mixed with bubbles of air. The cavity itself was filled with tissue, dark violet in color, which was composed of separate bodies, oval in form and a centimeter or more in size, in apposing facets, resembling finger impressions in the walls of the cystic cavity. These were carefully removed by curette. A lamina of bone was taken from the left tibia and introduced into the cystic cavity, and the wall of the cavity was crushed inward. The wound was closed and the leg put in a plaster-of-Paris spica.

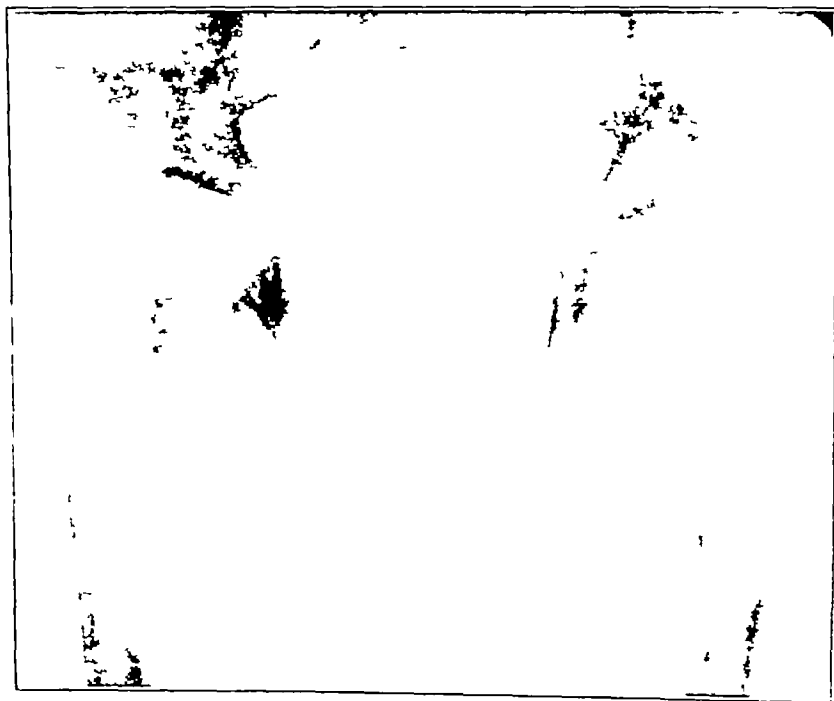


FIG 1

November 20 1929

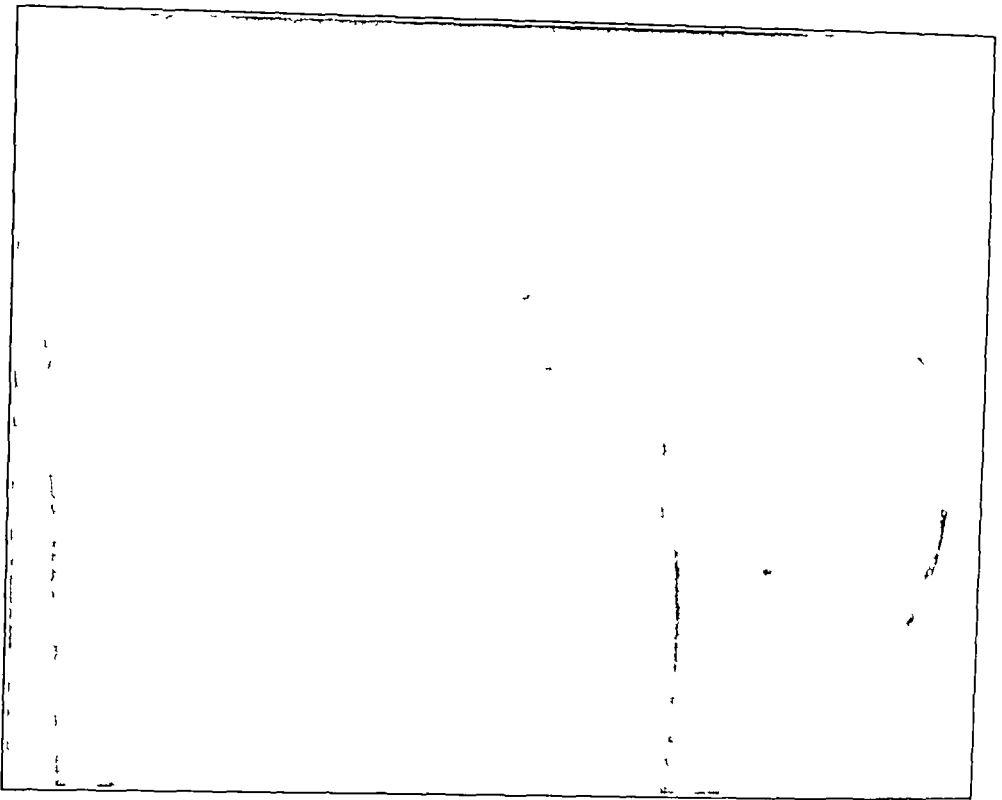


FIG 2

September 29, 1930

Laboratory investigation showed no growth of culture. Histologically, the crushed clots of blood contained few leukocytes. In the coagulated fibrin, leukocytes were more numerous.

Following the operation, the wound suppurated and the patient ran a high temperature for the following four weeks. On the fourth day, the wound was opened and thereafter required dressing every two or three days. Examination of the pus showed streptococcus and staphylococcus albus, and there was indication of a mild nephritis. Finally the child's general condition began to improve, and, on April 4, 1930, the wound was entirely healed. Some enlargement of the bone could be palpated about that area, but there was no definite sensitiveness.

On April 21, 1930, the child developed a temperature, with evidence of an acute purulent inflammation of the right middle ear with perforation of the membrane, and also of an acute inflammation of the left middle ear without suppuration. Examination of the mucus of the nose showed Löffler's diphtheria bacillus and the patient was removed to the infectious ward. After recovering from diphtheria, the child was examined and it was found that the wound had healed, the soft tissues had become firm, and there was no pain. A mass of bone could be palpated below the scar.

X-ray examination on May 19, 1930, showed that the upper portion of the hip was distinctly thickened. On the lateral aspect, there were two large compact masses of bone, spherical in shape, in contact with each other. These bone growths enveloped the distal portion of the head of the femur. The structure of the head was normal and the hip joint itself did not show any change. The report of the roentgenologist stated that the possibility of sarcoma was not to be excluded.

An x-ray, taken on July 27, 1930, showed that the size of the bone enlargement had increased. The spherical masses of bone had fused and assumed a macronuclear character. No epiphyseal cartilage was to be seen. The head of the femur was three-fourths of its normal size and had lost its normal form and structure.

X-ray examination (Fig 2), on September 29, 1930, showed that the enlargement of the bone had not increased, but had become more sclerosed and micronuclear in structure. In the middle third, there were two translucent areas—one round and one oval in shape—which, according to the report of the roentgenologist, were suggestive of giant-cell sarcoma. It was decided, however, that this was probably a process characteristic of osteodystrophia fibrosa cystica localisata.

On December 18, 1930, the patient was readmitted to the Clinic. The skin of the right leg was normal in appearance. A swelling, of the compactness of bone and without any central areas of softening, measuring six by eight centimeters, could be palpated. This swelling was not sensitive to palpation. Flexion of the hip and knee was normal.

Since the swelling had not ceased and this growth was characteristic of osteodystrophia fibrosa, it was decided to resort to operative interference. On December 22, 1930, under general anaesthesia, the cavity in the bone was opened by Prof. Tregubow and a bloody brown fluid was evacuated. The edges of the cavity were covered with evanotic granulations. A portion of the lateral wall was removed for histological examination, and all granulations were curetted. It was clearly evident that the wall of the cavity had a nuclear structure and there were to be seen the same fingerlike impressions defined by projections of more or less compact bone tissue. A portion of the lateral wall, two by four centimeters in size and retaining its periosteal attachment, was inserted into the cavity. The bony edges of the cavity were then crushed inward. The wound was closed and the leg was placed in a plaster-of-Paris spica.

Histological examination (Prof. G. L. Derman) of the specimen removed showed newly formed tissue, rich in cells, with a large number of polynuclear cells with hemosiderin precipitation, the development of cystic cavities, some new bone, and parts of the osteoid tissue. The histological diagnosis was osteitis fibrosa cystica localisata. No growth was obtained from the cultures.

There was a very marked unfavorable reaction to this operation. The stitches were removed on December 29. At this time, about thirty cubic centimeters of a brownish

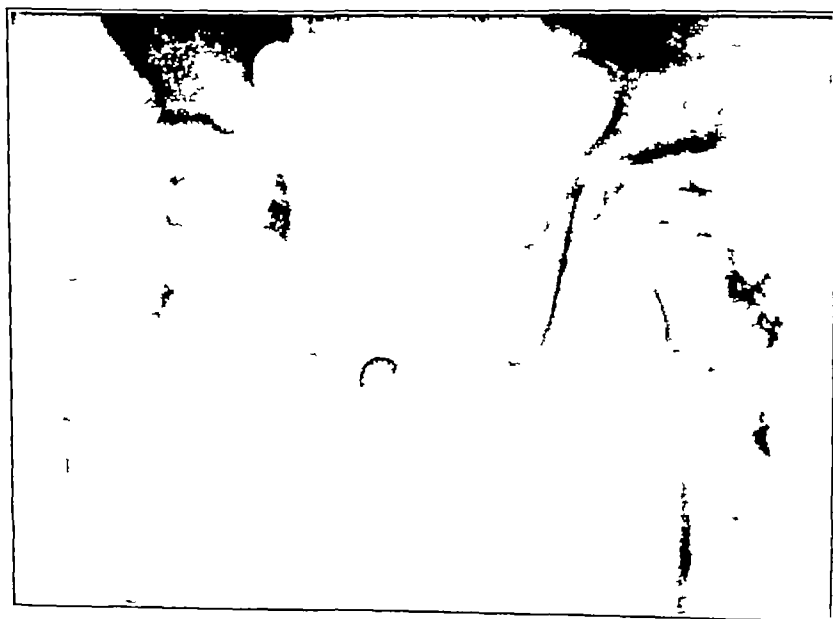


FIG 3
March 5, 1933

fluid evacuated itself and the wound required dressing every three or four days. Examination of cultures from this discharge showed a growth of streptococcus, proteus vulgaris, and bacterium coli commune, Gram's stain was negative.

In the middle of January 1931, a swelling developed in the right knee which became extremely sensitive. At the same time, the right ear also showed signs of an inflammatory process. These symptoms, however, did not persist.

From this time on, the general condition of the patient greatly improved and, on February 18, 1931, he was dismissed with a plaster-of-Paris bandage on the right leg.

On March 5, 1933, the patient was again examined. The x-ray (Fig. 3) showed the thickening of the upper portion of the femur to be insignificant. The structure of the bone tissue showed a more healthy character and an increase in the strength of the bone was inferred. There was an area of transparency in the upper epiphysis of the hip, but the outline of the epiphyseal cartilage was beginning to reappear more distinctly.

This case is of special interest, since the clinical course of this rather unusual condition can be followed almost from its onset until recovery,—a period of three years. The sarcomatous element to which this disease is very closely related must be recognized.

THE HOBART OPERATION *

A NEW COMBINATION OPERATION FOR RECURRENT DISLOCATION OF THE SHOULDER

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In the hope of finding an anatomical operation for the cure of recurrent dislocation of the shoulder that would give more nearly 100 per cent satisfaction, this operation was conceived. It is a combination of the modified Nicola operation^{1,2} and of the Clairmont operation³. It should be of particular use in cases in which the patients are undergoing severe strain, as in college athletics or in occupations requiring muscular exertion. Neither the Nicola operation nor the Clairmont operation has proved to be sufficient in all cases of severe strain.

TECHNIQUE

Under ether anaesthesia, a modified Nicola operation is done. With the patient on his back and the forearm flexed and pointing forward, an incision is made about one-half an inch posterior to the anterior border of the deltoid muscle, thus avoiding injury to the cephalic vein and allowing exposure of the bicipital groove and long tendon of the biceps, without cutting any of the muscle fibers (Fig. 1). In an adult, this incision would be about six inches long. A fine, black, silk suture is placed through the biceps tendon, near its distal end, and the tendon is divided proximal to this suture, either obliquely or by a Z-shaped cut. A second black, silk suture is placed through the cut distal end of the proximal piece of the tendon, and the ends of the suture are left long. With a quarter-inch drill, a tunnel, about two inches in length, is made underneath the bed of the biceps tendon. This tunnel is directed obliquely and so placed that the proximal aperture is at the junction of the cartilaginous edge of the head of the humerus and the proximal end of the bicipital groove (Fig. 2). This allows the long tendon of the biceps to be placed through the tunnel in an anatomical and physiological direction, avoids any sharp angle in the tendon, and obviates crushing of the tendon between the head of the humerus and the glenoid fossa.

Next, the sutures in the proximal end of the biceps are threaded through the eye of a blunt probe. The probe is passed through the tunnel, drawing the sutures and the tendon gently through after it. The long tendon of the biceps muscle is sutured together carefully (Fig. 3). The wound is closed temporarily with a towel clip.

The second step consists of a Clairmont operation. With the patient

* Read before the Chicago Surgical Society, March 1, 1935; presented before the Chicago Orthopaedic Club, May 13, 1935.

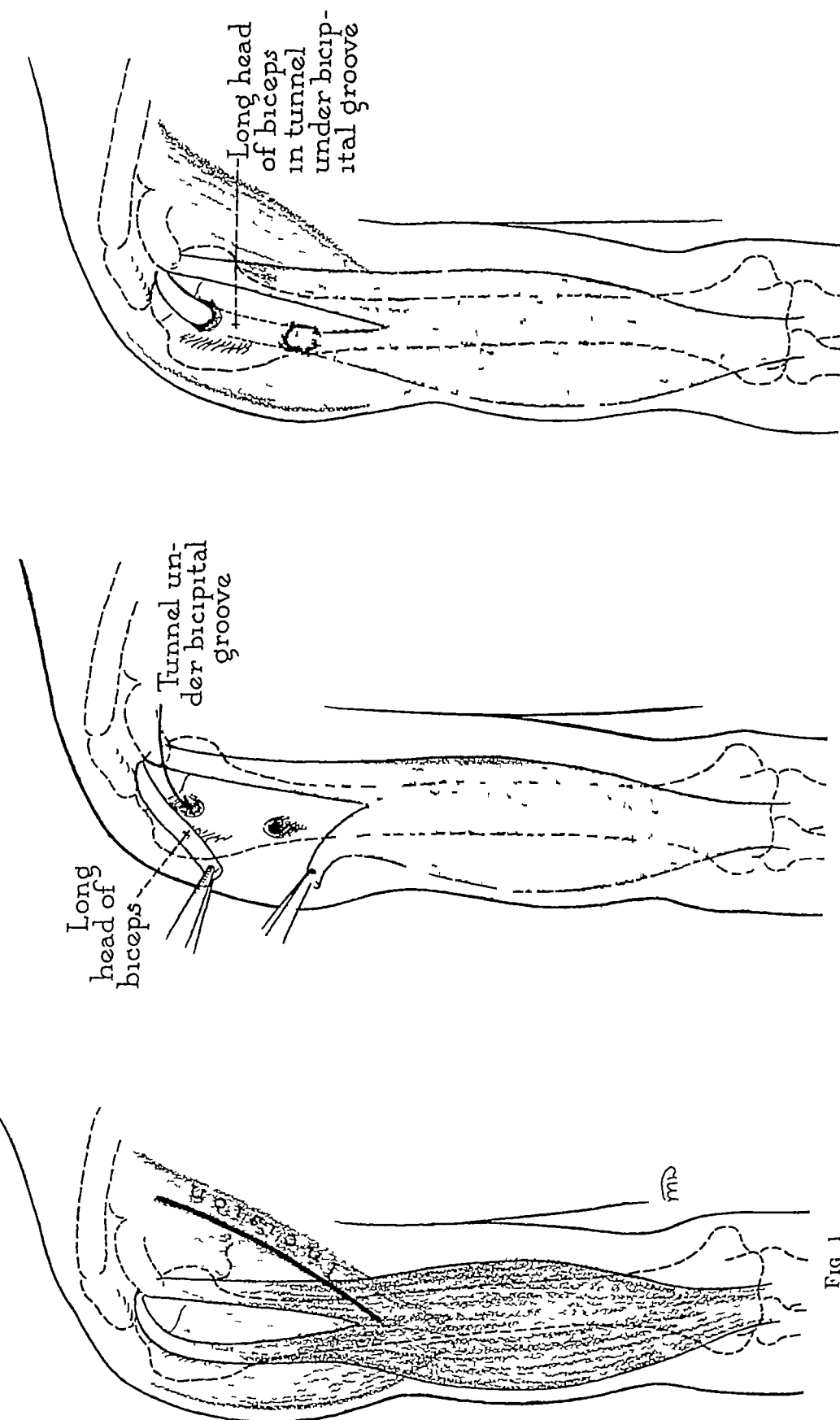


FIG 1

The newly placed incision for the Nicol's operation

FIG 2

The long head of the biceps is cut and a tunnel is drilled under the bicipital groove, without entering into the cartilage of the head

FIG 3

The long tendon of the biceps is placed in the tunnel and sutured to itself

propped up on a large sand-bag, an incision is made along the posterior edge of the deltoid muscle (Fig 4). A strip of that muscle is separated about an inch anterior to the posterior border and freed from its attachment to the deltoid tubercle on the humerus. This strip of muscle is then passed through the quadrilateral space (care should be taken to avoid injuring the posterior circumflex nerve and artery) under the surgical neck of the humerus and fastened to the anterior border of the deltoid with sutures. (Greater security might be insured in this part of the operation if the strip of deltoid muscle were fastened to the coracoid process⁴.)

The skin incisions are closed and a Velpau bandage applied. A cast is then worn for three weeks. Motion is gradually resumed, with careful physiotherapy. The patient can return to full duty in from two to three months.

CASE REPORTS

CASE 1 A K, a male, aged twenty-one, entered the Evanston Hospital on March 28, 1934 because of recurrent dislocation of the shoulder. In October 1933, while practising football, another player fell on the

patient's left shoulder and dislocated it. The trainer put it back. Again, in November 1933, this same shoulder was dislocated,—a subcoracoid displacement. This time the

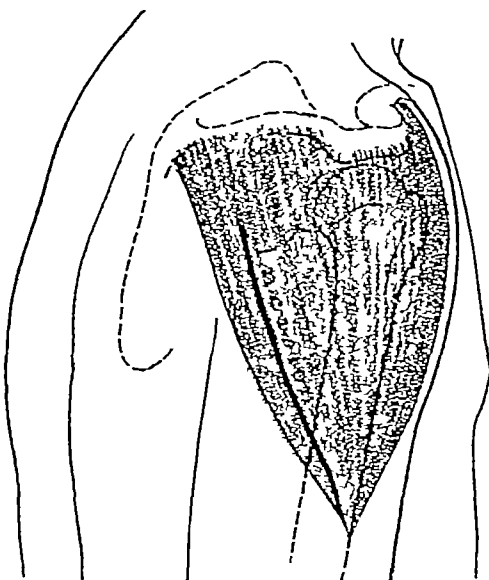


FIG 4

The posterior incision for the Clairmont operation

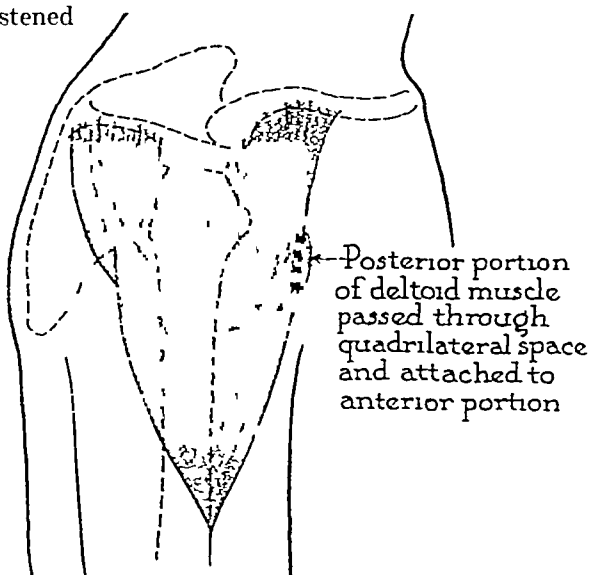


FIG 5

Showing completion of the Clairmont operation, with the posterior portion of the deltoid muscle passed through the quadrilateral space and attached to the anterior edge of the deltoid muscle.

dislocation was reduced at the hospital under an anaesthetic. The third dislocation occurred in a basketball game. Again it was reduced at the hospital. After each reduction, the arm was bound up in a Velpeau bandage for three weeks and subsequently protected for a time by means of a Sayre band.

On March 29, 1934, under ether anaesthesia, the combination operation was done. The patient made a good recovery and played through the football season in the fall of the same year. At that time, he wore a special shoulder pad, and abduction was limited by a chain from his elbow fastened to his belt. Following this, he played through the basketball season without any protection to his shoulder. His arm now gives him 100 per cent function, without pain.

CASE 2 J. H., a male, high school student and athlete, aged seventeen, entered Cook County Hospital, April 8, 1935, with the history that he had dislocated his left shoulder playing high school football in September 1934 and again on March 19, 1935, while swimming and stroking with the left hand.

On April 9, 1935, a combination operation was done under ether anaesthesia. The patient left the hospital on April 27, 1935, wearing a cast in the Velpeau position.

On May 3, 1935, a sling and Sayre band were substituted for the cast. The sling was discarded on May 31, 1935, and all motion was present.

CONCLUSIONS

While it is felt that the modified Nicola operation is adequate for most cases, the author believes that in those cases in which the patients are subjected to severe trauma, as in football, etc., its combination with the Clairmont operation is more likely to insure permanent reduction. A combination of the two operations has been employed in two cases with success. Its successful use in further cases is, of course, necessary to prove this operation reliable.

REFERENCES

- 1 HOBART, M. H. Recurrent Dislocation of the Shoulder. Nicola Operation. With Report of Cases. *J. Bone and Joint Surg.*, XV, 733, July 1933.
- 2 NICOLA, T. Recurrent Anterior Dislocation of the Shoulder. A New Operation. *J. Bone and Joint Surg.*, XI, 128, Jan. 1929.
- 3 CLAIRMONT, P. Ueber neue Operationsmethoden bei habitueller Schulterluxation. *Wiener klin. Wchnschr.*, XXX, 1507, 1917.
- 4 RYERSON, E. W. Personal communication.

COMPLETE ACROMIOCLAVICULAR SEPARATION

DIAGNOSIS AND OPERATIVE TREATMENT

BY RALPH F. BOWERS, M.D., NEW YORK, N. Y.

From the Surgical Department of the New York Hospital and Cornell Medical College

An accident may not in itself be of a serious nature, but the injury incurred may handicap the individual if he is not promptly and properly treated. General surgeons and orthopaedic surgeons who are called upon to treat accident cases are realizing more and more that anything short of restitution of function will hamper the patient economically and socially. Yet, some of the relatively minor injuries escape immediate detection, and the consequent delay in proper treatment causes loss of time and impairment of function to the injured. Such a minor injury is an acromioclavicular separation which yields to fairly simple treatment but which if incorrectly diagnosed or inadequately treated, may be the source of serious disability.

In considering this injury, the author wishes to call attention to six cases of complete acromioclavicular separation in which operative treatment has been used.

CASE REPORTS

CASE 1 A man, thirty-two years of age, was injured in an automobile accident. The physician who saw the patient after the accident reduced the deformity and immobilized the shoulder for six weeks, at the end of that time, the condition was unimproved. Physiotherapy was then employed for three months, without success. A fascial repair was done four and one-half months after the accident with satisfactory results.

CASE 2 A man, forty-eight years old, was injured in an automobile accident. The immediate treatment was similar to that in the first case and the results were equally unsatisfactory. Operation was delayed six months. A fascial repair was then done with a good functional result, but with slight deformity.

CASE 3 A man, aged thirty years, received his injury while playing football. He was treated for fracture of the clavicle, without improvement in his condition. Six weeks later, an operation for acromioclavicular separation was performed in which braided silk in place of fascia was used for the repair (Fig. 5). The result was excellent.

CASE 4 A man, aged forty-one years, suffered an injury to his shoulder and a fractured skull through some unknown cause. The shoulder condition was correctly diagnosed, but operative treatment was delayed on account of the more serious head injury. The operation was performed three weeks after the accident. In this operation braided silk was used as in Case 3. This patient was discharged with good function in spite of a slight deformity.

CASE 5 The patient had been thrown from an automobile and was found to have received the typical shoulder injury. He was operated upon immediately with an excellent result.

CASE 6 This case is a good example of the mechanism by which the injury may be

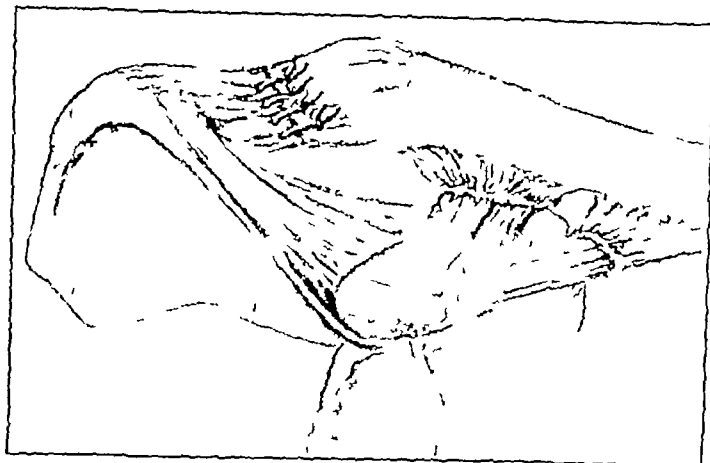


FIG 1

A method of approximating the articular surfaces of the acromioclavicular joint without regard for reconstruction of the torn ligaments

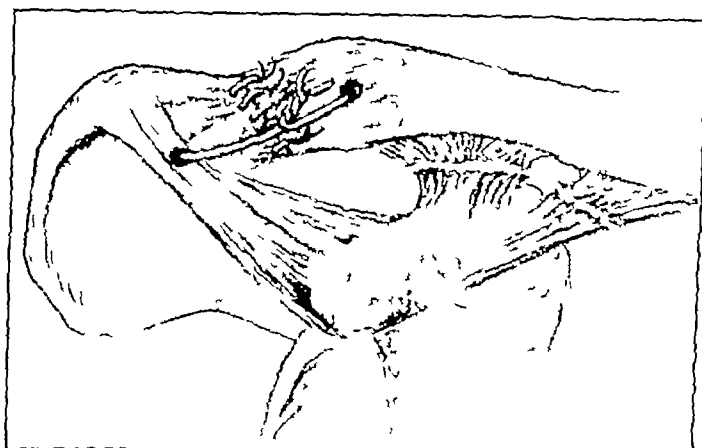


FIG 2

Another method of approximating the articular surfaces of the acromioclavicular joint

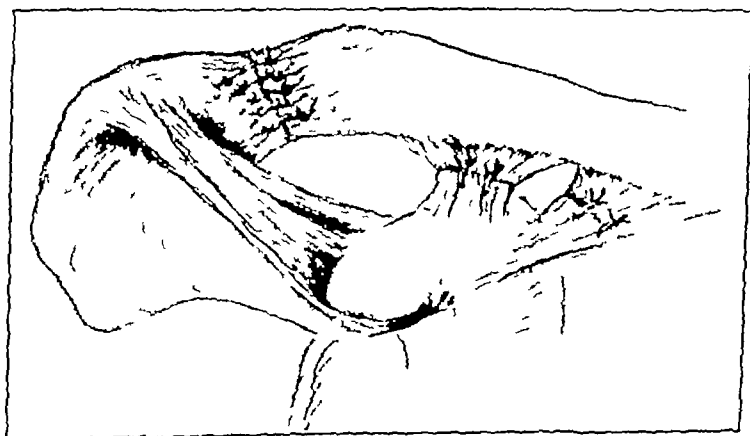


FIG 3

Cadenat's method of treating the injury. Because the ligaments are usually frayed, this operation is technically difficult

incurred. The patient was thrown from an automobile with great velocity and landed on his left side, with his arm pressed against his body. He skidded along the pavement for some distance in this position, the shoulder bearing the entire weight of the body and acting as a brake against its onward motion. Obviously a great force was exerted upon the shoulder in one direction by the momentum of the moving body, with a drag in the opposite direction caused by the resistance to that motion by the pavement. It is probable that as a result the weak capsule of the acromioclavicular joint first ruptured under the strain, leaving the ligamentum trapezoidum and ligamentum conoidum exposed to the entire force of the impact. The ligaments were torn through, causing a complete acromioclavicular separation. Physical examination revealed a typical deformity: the outer end of the clavicle was abnormally prominent and a depression was plainly visible below it. The abrasions which are shown in the photograph of this patient (Fig 6) support the theory of the origin of the injury. An operation was performed immediately. Six weeks later, the patient was able to lift light objects, and, at the end of three months, he could do heavy lifting.

A review of these six cases demonstrates the inadvisability of conservative treatment and the importance of early correct diagnosis and operative treatment. Three of the patients lost from six weeks to six months before a correct diagnosis had been made and proper treatment instituted. The other three patients, operated upon immediately or as soon as their general condition warranted surgical intervention, were rehabilitated within three months.

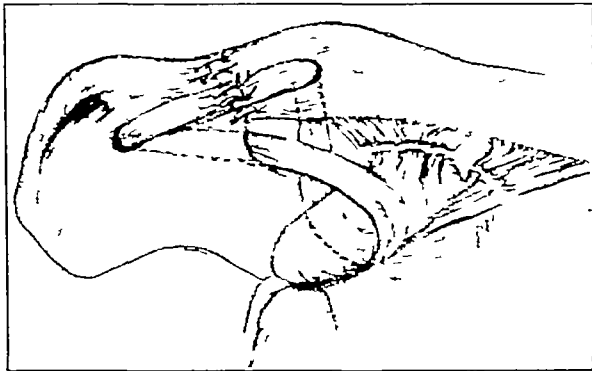


FIG 4

Bunnell's operation,—a fascial repair of the joint and fascial reconstruction of the ligaments

DIAGNOSIS

The diagnosis of complete acromioclavicular separation is based upon the typical deformity described in the last case,—the prominent clavicle and the depression below it. If the arm is raised passively upward, obliterating the cavity and approximating the outer end of the clavicle to the shoulder, the deformity appears to have been corrected, but, as soon as the supporting hand is withdrawn, the arm sinks back into its abnormally low position and the depression reappears.

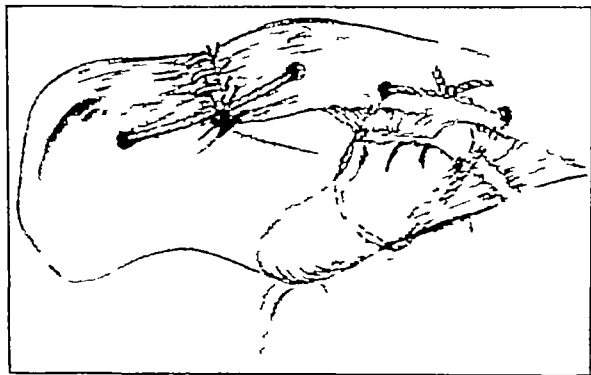


FIG 5

A modified method used by the author

If radical treatment is not instituted and if immobilization alone is relied upon to correct the injury, the surgeon will be disappointed at the end of several weeks to find that the deformity and weakness persist.

DIFFERENTIAL DIAGNOSIS

There are two conditions with which acromioclavicular separation may be confused,—namely, subglenoid dislocation of the head of the humerus and fracture of the outer end of the clavicle. X-ray examinations will rule out both conditions, although they may not reveal the true nature of the injury. Repeated roentgenograms, taken at different angles will,

however, usually show the separation. In subglenoid dislocation of the head of the humerus, the arm cannot be raised, in fracture of the clavicle, elevation of the arm is attended with effort and exquisite pain. Therefore, if the typical deformity exists, if the x-rays are negative for fracture or dislocation, and if the arm can be raised without great discomfort and falls back into its abnormally low position when released, the diagnosis is established and operative treatment should no longer be delayed.

TREATMENT

Incomplete separation of the acromioclavicular joint yields to the familiar methods in relatively short time. It is not with this injury that

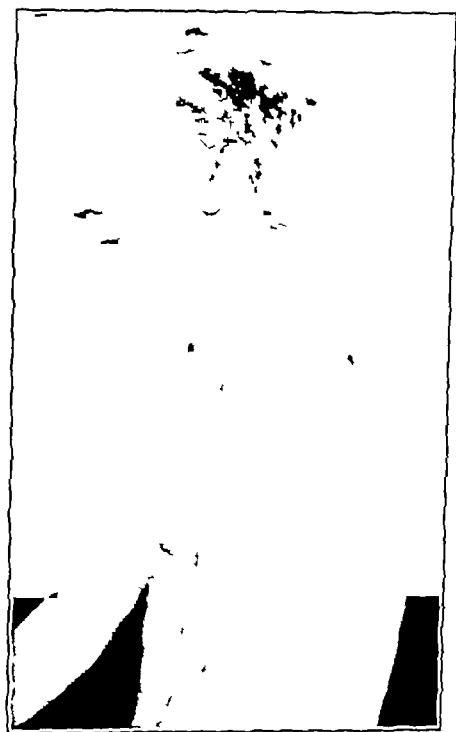


FIG 6

Case 6. Showing abrasions and typical deformity.

we are dealing. Conservative treatment of complete acromioclavicular separation has long been considered inadequate. Surgical intervention for this injury was first described by Cooper, in 1861, who united the acromion and clavicle with a metallic suture. Paci, in 1889, resected the outer end of the clavicle and fixed the joint by arthrodosis. Budinger fastened the bones together with a screw, Régnier used wire sutures and Tuffier used silk for the same purpose. Delbet and Lambotte employed nails to unite the ends of the bones successfully, bone grafts have also been used for this purpose. Cadenat describes the pathological anatomy of the injured shoulder very clearly. His operation is pictured in Figure 3 and is theoretically perfect, but difficult of accomplishment. Recently, Bunnell has recommended fascial repair of the joint and fascial reconstruction of the ligaments. (See Figure 4.)

Two points are of great importance in the treatment of acromioclavicular separation: the articular surfaces of the joint must be approximated and the ligamentum trapezoideum and ligamentum conoideum must be reconstructed. If the latter procedure is neglected, the deformity, pain, and weakness, although sometimes modified, will persist and disability will result.

The illustrations show the different methods of procedure. Bunnell's method (Fig. 4) is, in the author's opinion, the method of choice, although it is not necessary in every case to use fascia to reconstruct the joint and ligaments.

In general, the operation is performed as follows. An incision through

the skin and subcutaneous tissues is made over the shoulder. The torn capsule of the joint is exposed and, by blunt dissection, the coracoid process is freed so that suture material may be passed under it. A hole is drilled in both the acromion and clavicle through which autogenous fascia or braided silk is passed. The suture material is placed so as to form a figure of 8, which includes the coracoid process, and the ends are then stitched together over the joint. The joint capsule is closed with interrupted silk sutures and the wound is closed by the usual method.

The arm is placed in the Velpeau position for three weeks, after which time active and passive motion is prescribed for three weeks. No other form of physiotherapy has been found necessary. Hospitalization is required only until the skin incision is healed.

A modification of Bunnell's method is shown in Figure 5. In this operation, the articular surfaces of the joint are approximated with a suture either of fascia or of silk. The ligaments are reconstructed by drilling two holes in the clavicle and passing a ligature through them and around the coracoid process. Both methods have proved satisfactory although the modified operation appears to be simpler. Figures 1 and 2 represent methods which are not adequate, for they omit an attempt at reconstruction of the ligaments.

SUMMARY

Complete acromioclavicular separation is a relatively minor injury which is often the cause of disability when not correctly diagnosed and treated. If the x-rays are negative for fracture of the outer end of the clavicle and dislocation of the head of the humerus, the diagnosis of this injury may be established by the recognition of the typical deformity which is corrected by raising the arm upward.

Treatment should be undertaken without delay and should consist of an open operation with approximation of the articular surfaces of the joint and reconstruction of the torn ligaments.

BIBLIOGRAPHY

- BUDINGER, KONRAD. Zur blutigen Behandlung der Luxatio clavicularae acromialis und der Brüche des Nasenbeines. *Wiener klin. Wochenschr.*, XIII, 595, 1900.
- BUNNELL, STERLING. Fascial Graft for Dislocation of Acromioclavicular Joint. *Surg. Gynec. Obstet.*, XLVI, 563, 1928.
- CADENAT, F. M. The Treatment of Dislocations and Fractures of the Outer End of the Clavicle. *Internat. Clin.*, Series 27, I, 145, 1917.
- COOPER, E. S. New Method of Treating Long Standing Dislocations of the Scapulo-Clavicular Articulation. *Am. J. Med. Sciences*, XLI, 389, 1891.
- DELBET, P.-L.-E. Methode de traitement des fractures, avec la collaboration de Marchacq (jambe) et Masse et Lamare (bras). Paris, F. Alcan, 1916.
- FÜRST, ADOLF. Zur operativen Behandlung der Luxatio acromioclavicularis. *Zentralbl. f. Chir.*, LX, 12, 1933.
- JAMBOTTE, ALBIN. Chirurgie opératoire des fractures. Paris: Masson & Co., 1913.
- JASHFR, W. W. Cartilage Injuries. A Clinical Study. *Am. J. Surg.*, VI, 493, 1920.
- PACI AGOSTINO. La sutura metallica nella lussazione sopra-acromiale della clavicola. *Sperimentale*, LXIV, 600, 1889.

- REGNIER, L -R Des impotences fonctionnelles prolongées ou définitives dans les luxations de l'épaule Méd de Accid du Travail, II, 97, 1904
- TUFFIER, THEODORE, ET DESFOSSES, P Petite chirurgie pratique 1^{ed} 4 Paris, Masson & C^{ie}, 1914
- WATKINS, J T An Operation for the Relief of Acromio-Clavicular Luxations J Bone and Joint Surg , VII, 790, Oct 1925

INFRACOTYLOID DISLOCATION OF THE HIP

BY H PAGE MAUCK, M D , F A C S , RICHMOND, VIRGINIA, AND
RANDOLPH L ANDERSON, M D , F A C S , CHARLESTON, WEST VIRGINIA

The following case of infracotyloid dislocation of the hip is presented in the belief that it will be of interest because of the rarity of this dislocation

Wendel, in 1904, reviewed fourteen cases found in the literature and added one case of his own His paper presents a very complete discussion of the condition Niederle, in 1905, found three other cases in the literature and added one of his own After a careful search of the literature, we have been unable to find the reports of any other cases

An American girl, six years of age, was brought into the emergency room of the Memorial Hospital in Richmond, Virginia, on October 20, 1927 The child had fallen from the limb of a tree about five feet above the ground, landing on the right knee with the right hip flexed The pain was intense and she could not straighten her hip or knee She was brought to the hospital immediately

Examination showed a well-developed and well-nourished young girl who was suffering acutely There was nothing remarkable about her except the right lower extremity The right hip was flexed at an angle well over 90 degrees The right knee was flexed at about 90 degrees and approached the abdomen Another striking observation was the absence of both abduction and adduction, as well as the absence of both internal and external rotation On account of the child's pain and apprehension, no further examination was made at that time

An x-ray (Fig 1) of the right hip was taken, and the report read as follows: "The head of the right femur is outside the acetabulum, resting posteriorly just below the acetabulum on the descending ramus of the ischium"

The patient was given a general anesthetic, and the head of the femur could be felt just outside of the acetabulum and below it So far as could be determined, there was no difference in the length of the two extremities

An assistant held the pelvis flat on the table The dislocation was easily reduced by exerting traction upward on the flexed hip, with direct pressure upward against the head of the femur There was then no difficulty in extending the hip No retentive apparatus was applied with the exception of a muslin bandage over sheet-wadding, placed above the ankles and around the two extremities which were separated by a pillow

An x-ray (Fig 2), taken the following day, showed the hip in its normal position in the acetabulum

The child was kept in the hospital in bed for one week and was then sent home with instructions that she should remain in bed for another week

The patient was seen ten months after this injury and at this time there was no evident deformity of the hip, no shortening of the leg and no apparent relaxation of the capsule She walked normally and suffered no discomfort of any kind

On November 25, 1928, the child was again brought into the Memorial Hospital On this occasion, she was said to have been swinging when a playmate gave her an extra hard push She attempted to save herself from going against a wall by stopping herself with her foot She then fell out of the swing to the ground below injuring the right hip The exact mechanism of the injury was not known

The patient was not suffering as acutely as before The right hip was markedly adducted and internally rotated and the right leg was one and one-half inches shorter than the left

An x-ray (Fig 3) showed a posterior dislocation of the right hip of the ischiatic type

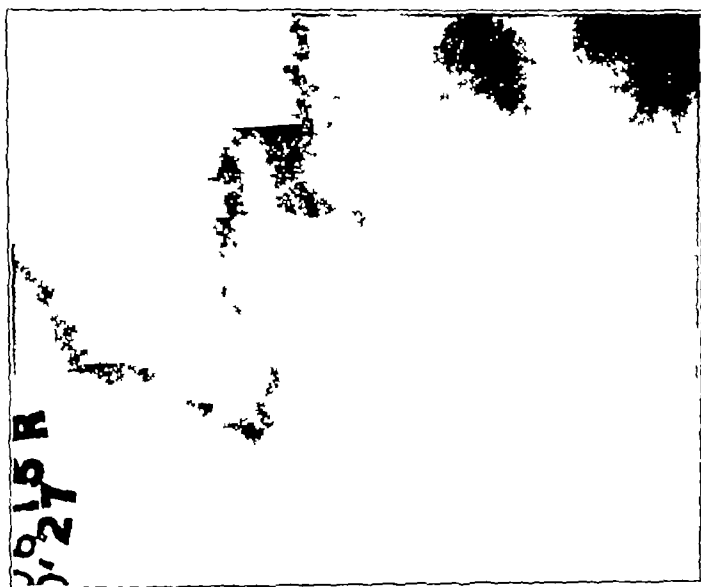


FIG 1

A general anaesthetic was administered and the dislocation was easily reduced by a member of the house staff. The legs were then bandaged together in the same manner as that employed after reduction of the first dislocation.

A subsequent X-ray (Fig 4) showed the hip again in normal position. The patient remained in the hospital for one week and instructions were given that she should be kept in bed for three more weeks at home.

This child was followed carefully for a period of three months following the last dislocation. At the end of that time, she had no muscle spasm nor limitation of motion, and she walked without a limp. She was seen about every six months for three years. The affected hip and leg remained normal.

The mechanism of the dislocation requires a word. A majority of the patients whose cases have been reported sustained the injury by a fall from a height. This type of dislocation usually occurs in young adult males who have sustained a fall from a height or whose hips have been forced into wide abduction. The affected limb is usually in extreme flexion. Our patient fell from a height of only four or five feet, but she fell on her knee, transmitting the force directly to the hip.



FIG 2

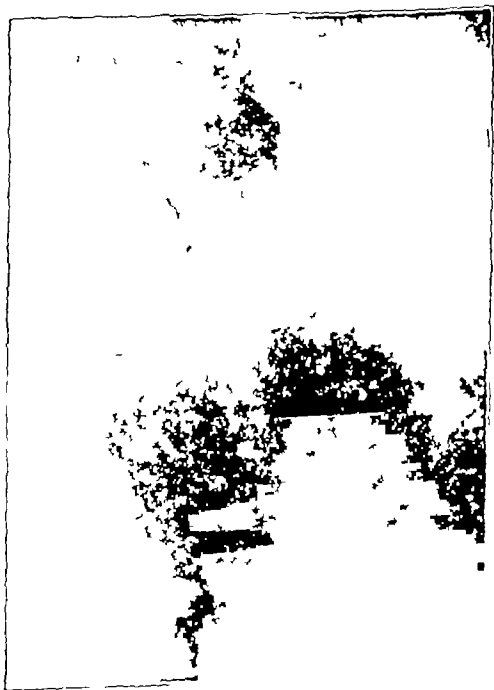


FIG 3



FIG 4

Wendel thinks that the injury is produced by a combination of flexion, abduction, and internal rotation

Little is known of the pathology. In the one case in which an autopsy was obtained, the tear in the capsule was found to be just large enough to allow the head to escape.

We have been unable to find the reports of any other cases of traumatic dislocation of the hip of any type in which a dislocation recurred. Our own case seems to be unique in this respect. These dislocations are easily reducible under anaesthesia by simple traction on the flexed thigh. No disability is noted following this condition.

Perhaps it may be well to mention the analogy of infracotyloid dislocation of the hip to infraglenoid dislocation of the shoulder. Wendel describes this well. The clinical pictures in which the shoulder is held straight up over the head and the hip is sharply flexed on the abdomen are similar.

BIBLIOGRAPHY

- LAUENSTEIN, CARL. Das Röntgenbild einer Luxatio femoris infraglenoidalis. Fortschr. a. d. Geb. d. Röntgenstrahlen III, 186, 1899-1900.
- MAFFEI, FILIPPO. Contributo allo studio della lussazione traumatica dell'anca nell'infanzia. Chir. d. Org. di Movimento, VI, 604, 1922.
- NIFDERLE, B. O spodní luxaci v kloubu kyčelním. Luxatio femoris subglenoidalis a infracotyloidea. Sborník Klinický, V, 433, 1903-1904. (Abstracted in Zentralbl. f. Chir. XXXII, 31, 1905.)
- WENDEL, WALTHER. Die Luxatio femoris infracotyloidea. Deutsche Ztschr. f. Chir. LXXII, 153, 1904.

AN OPERATION FOR CORRECTION OF DEFORMITIES OF THE WRIST FOLLOWING FRACTURE

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Operations for correction of deformities of the wrist following mal-united fractures have been described by Lothrop¹, Meyerding², and Thornton³. Others are mentioned in articles by various authors⁴.

All of the procedures described by these writers have the disadvantage of requiring prolonged postoperative splinting with the wrist in flexion and the resultant dangers of fibrosis and shortening of the structures on the flexor surface.

To overcome this difficulty, the following technique has been devised. It has been used successfully in four cases. The first of these operations was done five years ago. This patient was a laborer. He has had complete return of function and has been able to work steadily during this period without any difficulty. The other cases are more recent, but in all excellent functional results have been obtained.

For the sake of clarity, tracings of typical roentgenograms are presented rather than reproductions of the negatives.

TECHNIQUE

An incision is made, beginning at the level of the radial styloid, lateral to the extensor carpi radialis longus tendon, and extending upward about two and one-half inches. Care is taken not to injure the abductor pollicis longus and extensor pollicis brevis which cross the tendon of the extensor carpi radialis longus obliquely toward the thumb. These structures are retracted dorsally and laterally. The periosteum is then incised longitudinally. If previous roentgenograms show the distal fragment to be tilted posteriorly but not overriding (Fig. 1), the fracture line need not be exposed in front. If, however, there is backward displacement of the distal fragment on the proximal fragment, the full width of the bone is exposed both front and back. In the former type of deformity, a transverse osteotomy is then done through the lateral, posterior, and medial cortex. The angulation is corrected by subperiosteal fracture of the anterior part of the cortex. If the deformity is of the latter type, a complete osteotomy is done in the appropriate direction and the distal fragment is pulled into position. If there is a deformity of the ulna, the same procedure may be carried out on that bone through a posteromedial incision, or the head may be excised. The latter has not been done in any of the cases reported.

The next step in the operation consists of removing a wedge-shaped piece of bone from the most convenient exposed part of the proximal fragment of the radius (Fig. 2). The size and shape of the base of the

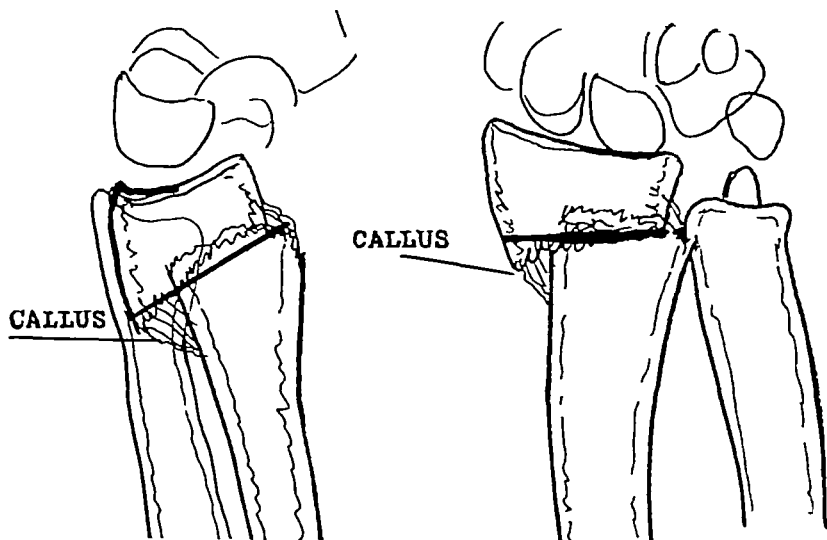


FIG 1

Tracing of roentgenograms, showing line of osteotomy

wedge must be gauged accurately as it is used to fill the defect in the posterior surface of the radius made by the osteotomy. The width of the base of the wedge is determined by the amount of flexion and ulnar deviation of the distal fragment required to correct the deformity. One end of the wedge may be made slightly wider than the other if it is desirable to tilt the distal fragment to one side or the other. The wedge is then inserted in the transverse line of osteotomy.

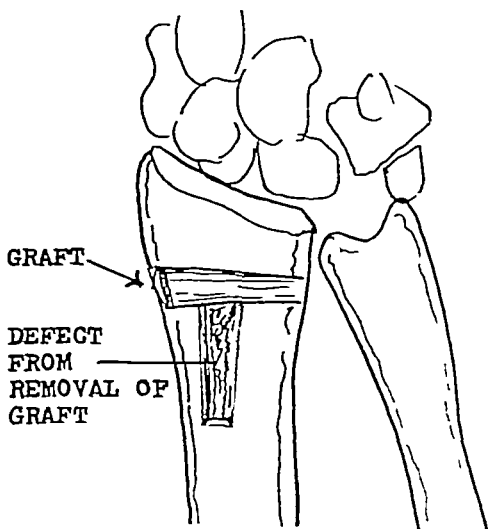


FIG 2

Tracing of roentgenogram after operation showing deformity corrected, position of graft and defect left by its removal

If it fits snugly, it holds the distal fragment in the corrected position without the use of any internal fixation other than suture of the periosteum. It is unnecessary to do this step of the operation on the ulna, as the radius acts as a splint for the ulna, holding it in the new position. After closure of the wound, the hand is placed in acute flexion on a Jones type of anterior splint. This splint permits easy access to the wounds for dressing and massage. The amount of flexion is decreased every other day, until, it

the end of the second week, the wrist is in full extension. At this time, the splint is removed and replaced by an elastic bandage. Use of the wrist is encouraged. As soon as skin healing permits, massage is instituted, with the hand in the splint, and is continued every day for a month, when all retentive bandages are removed.

TABLE I
SUMMARY OF CASES

Sex	Age (Years)	Occupation	Type of Fracture	Duration	Site of Operation	Result
M	28	Roofer	Colles'	3 months	Radius	Good function and appearance
M	38	Clerk	Colles	2 months	Radius	Good function and appearance
M	12	Student	Both bones one inch above wrist	2 months	Radius (Wedge shaped osteotomy) Ulna (Osteotomy)	Good function and appearance
F	10	Student	Colles	2 months	Radius	Good function and appearance

COMMENT

The operation described for correction of deformities following Colles' fracture and fracture of the radius and ulna near the wrist has been employed in four cases with success. This operation obviates some of the difficulties pertaining to other procedures and restores normal anatomical relations, a prerequisite to complete restoration of function.

REFERENCES

1. SCUDDER, C. L. *The Treatment of Fractures With Notes upon a Few Common Dislocations*. Philadelphia, W. B. Saunders Co., 1926.
2. MEYERDING, H. W. Malunion of the Radius and Ulna Preventing Closing of the Hand and Flexion of the Wrist. *Surg. Clin. North America*, XII, 874, 1932.
3. THORNTON, LAWSON. A Plastic Operation for Reduction of Old Transverse Fractures of the Distal End of the Radius, Healed with Displacement and Deformity. *Surg. Gynec. Obstet.*, XLII, 844, 1926.
4. GHORMLEY, R. K., AND MROZ, R. J. Fractures of the Wrist. A Review of One Hundred and Seventy-Six Cases. *Surg. Gynec. Obstet.*, LV, 377, 1932.

ACUTE INTERMETACARPOPHALANGEAL CALCIFICATION

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The intermetacarpophalangeal spaces, lying between the adjacent heads of the index finger and the little finger, are limited in part by the ligamentum capitulorum transversum. This ligament unites the heads of the second, third, fourth, and fifth metacarpal bones and consists of three short bands which measure about six millimeters in length and slightly less in width. A lumbricalis with digital arteries and nerves passes to the ventral aspect of the transverse ligament, while behind and along the metacarpophalangeal joints pass the interosseal muscles to reach their insertions in the bases of the first phalanges and the tendons of the extensor digitorum communis. Between the interosseal muscles lie the intermetacarpophalangeal bursae. These bursae are said to extend from the metacarpal heads to the bases of the first phalanges of the corresponding spaces and are related, laterally, to the interosseal muscles and, ventrally, to the transverse ligaments.

Concerning these intermetacarpophalangeal bursae, it may not be out of place to quote Gruber (1858) who wrote that they occur only as anomalies and are found mostly in elderly individuals. He never encountered them in the embryo, occasionally he saw them in new-born infants, but felt that in these instances he was dealing with small demarcated spaces of connective tissue which had formed pocketlike recesses. He calculated the number of bursae in several ways when they were determined according to the number of bodies, he found them present in 33.33 per cent of the cases, and when computed according to the number of hands, in 20 per cent. They were more commonly seen in the right hand than in the left hand and occurred in the interspaces as follows: * in the second interspace, 75 per cent; in the third, 50 per cent; in the first, 33 per cent. He found that the bursae occurred singly, but occasionally they were divided by a partitionlike wall. In form, they were usually oblong and measured up to six millimeters in length and to five millimeters in depth.

The present paper deals with a case of acute inflammation with calcification, involving an intermetacarpophalangeal space of the hand. The clinical findings point somewhat to a tendonitis of the interosseous muscle or to a possible acute calcified intermetacarpophalangeal bursitis but, in the absence of operative intervention, it is felt that the changes, for which the author can find no description in the literature, may only be presented as those of an acute intermetacarpophalangeal calcification.

* The percentages are based on the number of bursae found in any given space as compared to the number of hands dissected.

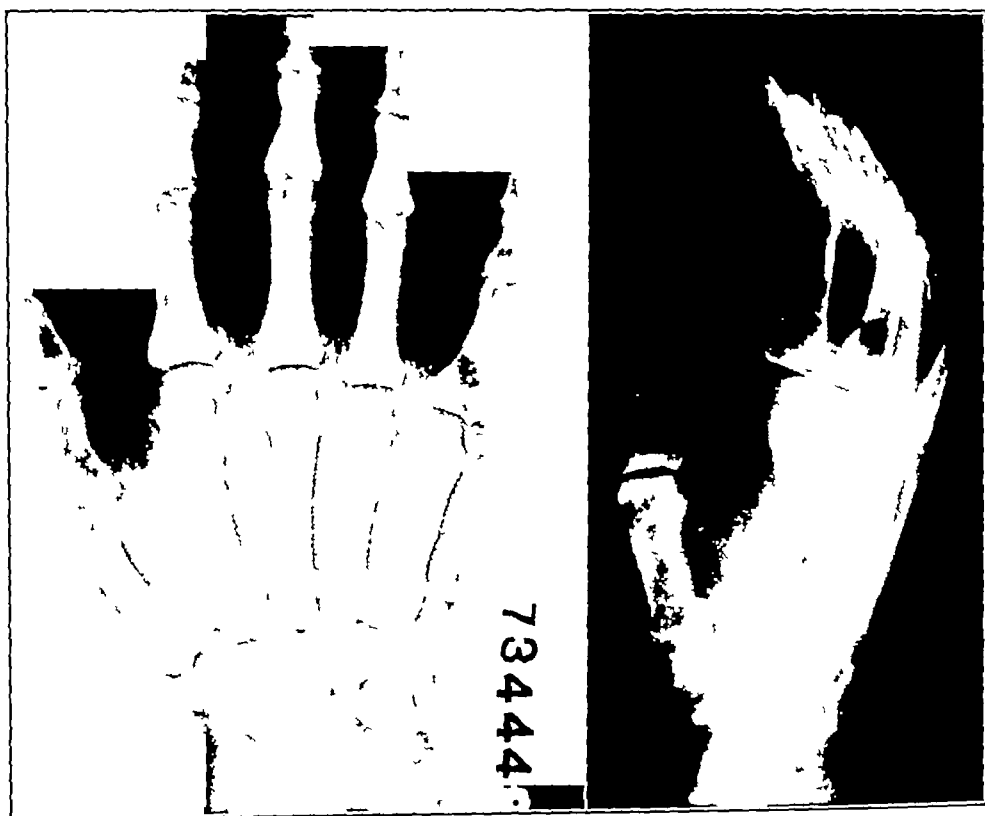


FIG 1

Showing calcification in the intermetacarpophalangeal space between the index and middle fingers

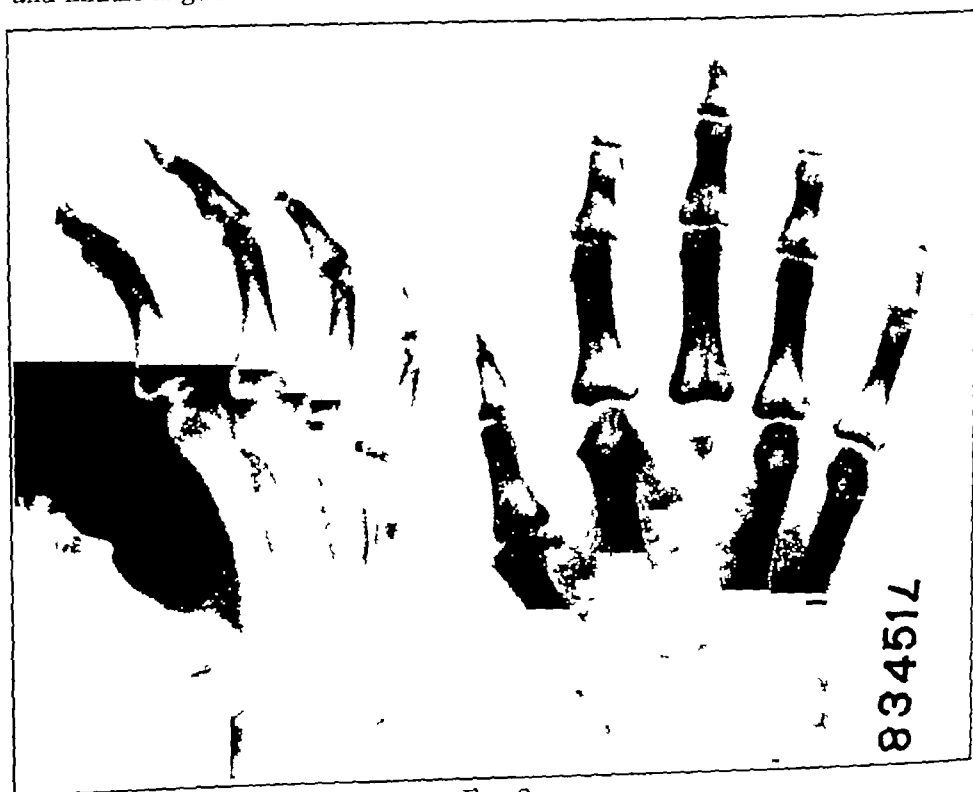


FIG 2

Showing absorption of calcium in the intermetacarpophalangeal space about three weeks after onset of inflammation

CASE REPORT

On July 24, 1934, about four days prior to examination, the patient, a white male, seventy-five years of age, had experienced sudden pain and later had noticed swelling and redness of the right hand. The remaining history is unimportant except for the fact that the patient had been treated for a gum boil, necessitating the extraction of a tooth, four weeks prior to the onset of his illness.

At examination, the right hand presented a moderate swelling which involved the dorsal and to a slight degree the volar aspect, extending slightly over the metacarpophalangeal joint and first phalanx of the index finger. This swelling seemed to be greatest in the space between the heads of the metacarpal bones of the index and middle fingers. It diminished gradually while passing toward the ulnar and radial sides of the hand and also toward the wrist joint. There appeared to be some thickening of the knuckle of the index finger. Tenderness was present to a slight degree over the metacarpal bone of the index finger, both on the volar and dorsal aspects, but was very marked in the space on the dorsum between the heads of the bones and immediately proximal to a line joining their articular surfaces. There was limitation of extension and of flexion of the first finger, the angle of greatest extension being 180 degrees and the angle of greatest flexion, 130 degrees. Motion between these two points was somewhat free and painless. The temperature by mouth was 99.5 degrees, and the blood Wassermann test was negative.

An x-ray of the right hand showed a calcified mass, flake-like in appearance, situated in the space between the heads of the metacarpal bones of the index and middle fingers, ex-

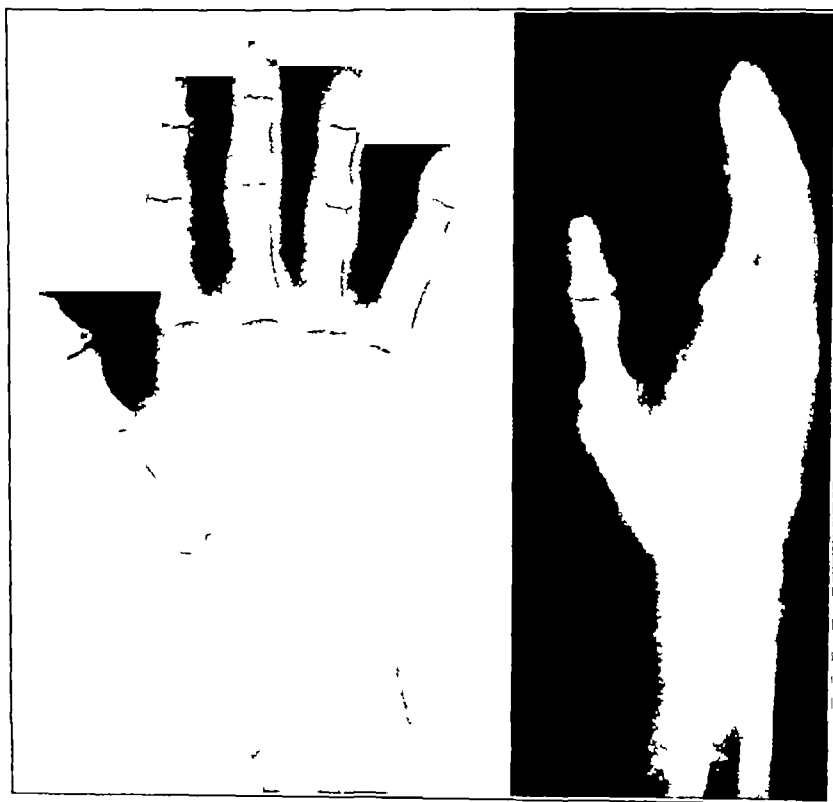


FIG. 3

Showing almost complete absorption of calcium in the intermetacarpophalangeal space.

tending distally to a little below the level of the articular surfaces and proximally to a short distance from the heads. The greater portion of the mass was seen close to the metacarpal bone of the index finger. There was no evidence of bone or joint involvement (Fig 1).

The acute symptoms gradually subsided. Flexion of the finger improved and the swelling diminished, but there remained a slight fullness of the space between the metacarpal heads. Tenderness, although slight, still persisted in this region, but began to disappear in the other areas which have been described.

On August 16, 1934, the patient complained of a sudden onset of severe pain in the region of the right shoulder. The clinical examination presented the usual picture of an acute subdeltoid bursitis. An x-ray, taken two days later, confirmed the diagnosis and displayed calcification in the region of the bursa. On the same day, an x-ray (Fig 2) was also taken of the right hand which showed some absorption of calcium.

On November 23, 1934, x-ray examination of the right shoulder and the right hand (Fig 3) revealed almost complete absorption of the calcium in both areas. Clinical examination showed that all the motions of the right shoulder had returned to normal, but there was pain on extreme abduction. A slight amount of tenderness remained over the subdeltoid bursa. The hand presented some tenderness and fullness in the region between the metacarpal heads. The knuckle was thickened. The patient could extend the index finger fully, but had a slight limitation of flexion.

On reviewing our clinical findings we have an acute low-grade inflammatory process, with calcification, localized in an intermetacarpophalangeal space. This inflammation does not appear to include a metacarpophalangeal joint or any bone. The x-rays show a calcareous deposit in the interval between the metacarpal bones. Associated with this inflammation is a tendonitis and calcification of the supraspinatus muscle (subdeltoid bursitis).

After a careful survey of the clinical findings and the anatomy of the intermetacarpophalangeal space, it would certainly appear that we are dealing with a tendonitis with calcification, involving that portion of the interosseus volaris which has its origin on the ulnar side of the metacarpal bone of the index finger and inserts into the extensor digitorum communis tendon and the base of the first phalanx of the same digit. One cannot dismiss the possibility of a calcified intermetacarpophalangeal bursitis, but, in this instance, serious consideration need not be given to the possible presence of a pathological calcification resulting from myositis ossificans, calcinosis interstitialis, Raynaud's disease, and other like conditions. However, in spite of the historical, clinical, and x-ray evidences which would point to a tendonitis with calcification, one hesitates to offer the diagnosis as absolutely final and it would, presumably, be preferable to designate this condition as an acute intermetacarpophalangeal calcification.

BIBLIOGRAPHY

- GRUBER, WENZEL. *Die Bursae Mucosae der Spatia intermetacarpo-phalangea et intermetatarso-phalangea*. (Reprinted from *Mémoires des Savants Étrangers*, VIII.) St. Petersburg, 1858.
- MORRIS'S HUMAN ANATOMY. *A Complete Systematic Treatise by English and American Authors*. Edited by C. M. Jackson. Ed. 8. Philadelphia, P. Blakiston's Sons & Co., 1925.
- SPALTEHOLZ, WERNER. *Hand-Atlas of Human Anatomy*. Fourth English Edition. Edited and translated from the Seventh German Edition by Lewellys F. Barker. Philadelphia, J. B. Lippincott Co., 1923.

VASCULAR MASSAGE

ITS TECHNIQUE AND USE

BY H. JORDAN, M.D., NEW YORK, N. Y.

At the meeting of the German Orthopaedic Society in Prague, in September 1928, Schede and Bettmann suggested new ideas about the use of a tourniquet or a similar device for the treatment of various circulatory disturbances of the extremities. As the treatment by this so called "vascular massage" has proved to be quite satisfactory in the author's experience of about six years, he believes that a report of the method may be of value and that the introduction of this treatment should be encouraged.

The writer is indebted to Dr. W. R. Bett, Medical Librarian of Columbia University, for bringing to his attention an article by Dr. Harvey Cushing who, in 1902, recommended the use of the tourniquet in cases of Raynaud's disease. Since that date, to the author's knowledge, the American literature contains no reference to this method.

The technique employed in vascular massage is based upon Bier's principles of hyperaemia. The removal of the tourniquet or the Es-march bandage is followed by an extreme hyperaemia, due mainly to the effect of aspiration or suction of the smallest vessels and capillaries and the "hunger of the tissues for blood."

According to Elbecke (following Bettmann), the capillaries dilate during the bloodless state because of either the want of oxygen or the accumulation of the waste products of metabolism. Schede and Bettmann state that the mechanical principle of this treatment is based upon the stimulation of the failing circulation and resorption by means of rhythmic interruption and opening of the arterial blood stream. The sluggishness of blood circulation and metabolism is overcome. From the improved vascular reaction, there results an accelerated exchange of anabolic and catabolic substances. The rhythmic change in the contents of the blood vessels, fluctuating on both sides above and below the normal limits, increases influx on the arterial side, on the venous side, the relaxed tissue of the walls of dilated veins is stimulated, thereby gaining in strength and elasticity. By increasing the blood circulation and metabolism of all the tissues of the section of the limb under treatment, the nutrition of the muscles and bones is also improved, and congestion or swelling disappears.

The technique of vascular massage is very simple in its application. The patient lies in bed or on an examining table, massage bench, etc. The foot of the leg to be treated rests in a sling, easily made from a piece of stockinet, from which a rope runs through a pulley suspended above the foot. The free end of the rope can be weighted with a sand bag to compensate for the weight of the leg, or the patient himself may control the rope with the hand. The interruption of the flow of the blood takes place

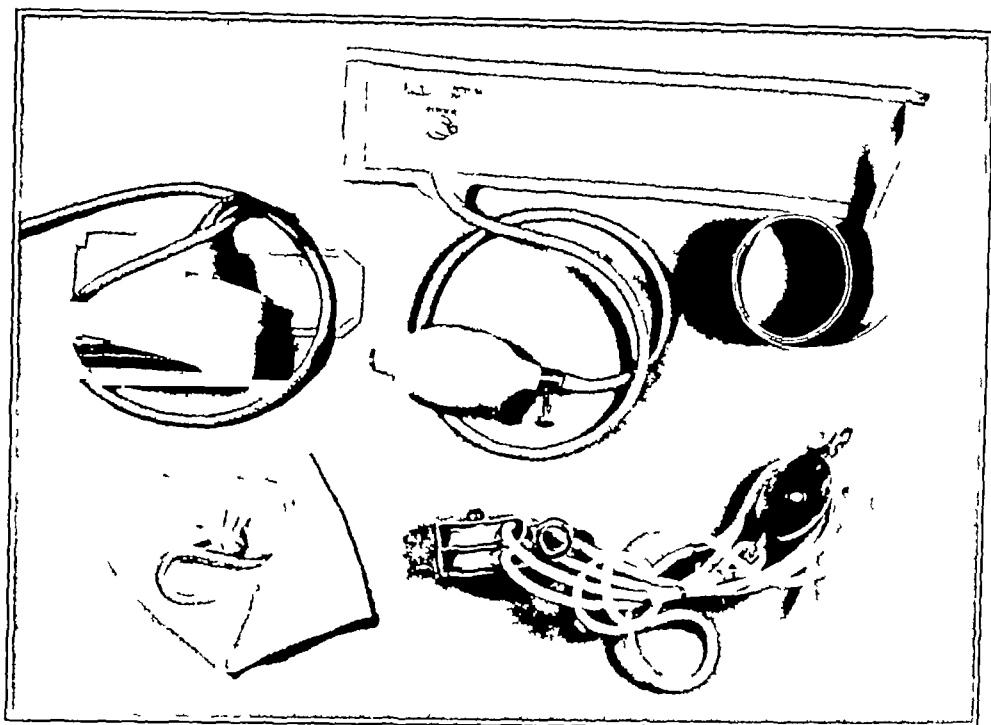


FIG 1

Outfit for vascular massage

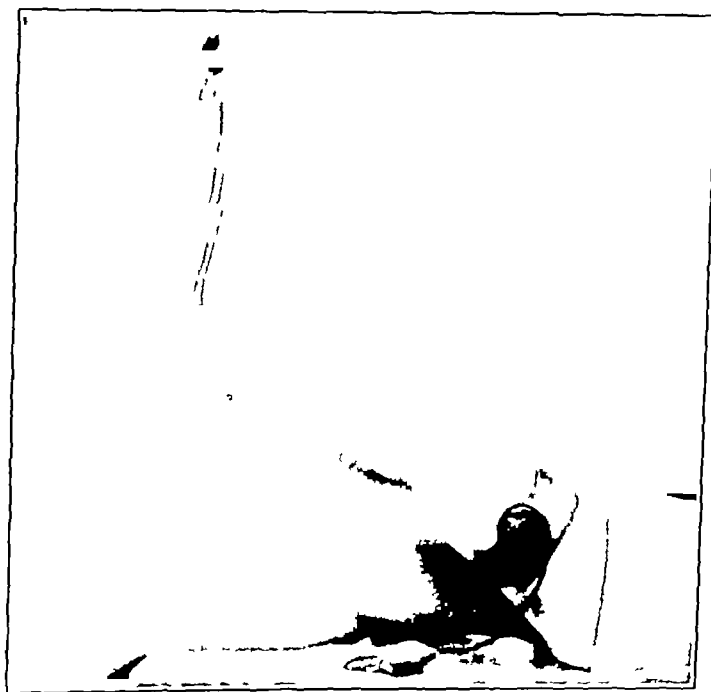


FIG 2

First stage of vascular massage

at about the middle of the thigh. The author uses a rubber cuff which can be inflated and which is directly connected with a rubber bulb. The outfit corresponds to the cuff of a blood-pressure apparatus (hemodynamometer) (Fig 1).

The treatment is divided into three movements.

1 The leg is raised as high as possible. This is facilitated by the pulley. The blood flows toward the center out

of the limb, leaving it empty. (See Figure 2.)

2 The cuff is filled quickly with air until the arterial blood stream is interrupted. The leg is lowered to a horizontal position, and the anaemia is continued. The skin becomes pale and cold.

3 The valve is opened, the anaemia is relieved, and the blood shoots in. The patient feels a pleasant warmth flowing peripherally, the skin becomes rosy to the tips of the toes, then completely red and warm.

Each movement lasts one minute, thus the cycle takes a little over three minutes. The duration of the whole treatment varies according to the indication and reaction. The writer usually begins with fifteen minutes and increases the time to a maximum of thirty minutes. The treatment of an arm is carried out in a similar manner.

The constriction of the thigh or upper arm which is necessary in order to obtain proper anaemia may, especially at first, cause more or less discomfort. Naturally, the degree of sensitiveness will vary according to the individual. In the author's experience, the patients soon become accustomed to the pain, and more quickly so if they are entrusted with the management of the tourniquet. The degree of bloodlessness necessary to effect the vascular massage has always been obtained.

The field of application of vascular massage is wide. Having in mind the contra-indications to be discussed later, the author wishes to mention the following indications:

A Lower Extremities

1 Symptoms of fatigue of the muscles after exertion in work or sports, cramps of the calf muscles, burning of the soles

2 Signs of congestion in the leg and foot

3 Varicose veins of mild or moderate degree

4 Ulcers of the leg and poorly healing wounds after trauma

5 Painful, stiff, spastic flat feet

6 Hematomata following sprains and contusions of the feet, etc

7 Fractures, especially

a To stimulate callus-formation,

b To avoid decalcification

8 Post-traumatic atrophy of the bone (Sudek) with and without demonstrable fracture

9 Pain due to poor circulation in amputation stumps

10 Poor circulation of the skin and doughy induration of the subcutaneous tissue, puffiness at the ankles, thickening of the lower third of the legs, frequently seen in young females, after-effects of poliomyelitis, with susceptibility to frost, preventive treatment of frost-bite and chilblains

B Upper Extremities

In the case of the upper extremities, the field of application is similar, although naturally more restricted. Besides signs of congestion from various causes, including all kinds of results from injuries, there must be mentioned, above all, painful amputation stumps, Raynaud's disease and similar diseases, and, finally, the peculiar painful conditions and paraesthesia in women before and during the menopause.

To the contra-indications belong poor general condition, advanced arteriosclerosis, and inflammation of all kinds, especially infections of the extremity to be treated. An absolute contra-indication is given by thrombosis and thrombophlebitis. Naturally, until solid union has taken place, fixation of a fracture should never be interrupted in order to use vascular massage.

Since 1929, the author has used vascular massage in a wide variety of orthopaedic and traumatic cases with results which have encouraged him to consider this procedure one of unusual merit.

It is not the purpose of this paper to detail individual case reports. Suffice it to say that, in conditions in which the therapeutic indication dictates measures designed to improve the vascular supply of either the upper or the lower extremities, this simple, safe, and inexpensive method should not be neglected.

REFERENCES

- BETTMANN, E. Ein neuer Apparat für Blutleere und Gefäßmassage. *Chirurg*, I, 647, 1929.
- BETTMANN, E. Die klinischen konservativen Behandlungsmethoden des versteiften Plattfußes. *Verhandl. d. Deutschen Orthop. Gesellsch.* (1931), XXVI, 397, 1932.
- CUSHING, HARVEY. Treatment by the Tourniquet to Counteract the Vasomotor Spasm of Raynaud's Disease. *J. Nerv. and Ment. Diseases*, XXIX, 657, 1902.
- SCHEDE, F., UND BETTMANN, E. Zur Therapie von Ergüssen und Gefäßstörungen an den Extremitäten. *Munchener med. Wchnschr.*, LXXIX, I. Hälfte, 861, 1932.

HEMIHYPERTROPHY TOTALIS

A CASE REPORT

BY EDWARD H. CROSBY, M.D., HARTFORD, CONNECTICUT

Although man's body is considered symmetrical, minor differences usually make one side decidedly different from the other. Such differences do not, as a rule, interfere with the function of the body as a unit. Inequality in the length of the legs, in the size of the hands, and even in the palpebral fissures is not uncommon.

It is often difficult to determine which is the normal side, especially if each side taken by itself seems to be normal. In the literature, some cases are termed hemihypertrophy and others hemiatrophy according to which side is considered normal, but, when each side is normal and functions perfectly, the terminology is open to discussion.

In 1927, Gesell made a complete study of hemihypertrophy. He found reported in the literature the cases of fifty-three patients, of whom twenty-three were male and thirty female. In twenty-five of these patients the right side was involved and in twenty-eight the left side was affected. Skin complications occurred in twenty-four of the cases, and eight patients were mentally defective. He considered hemihypertrophy as one of the rarest of anomalies and as essentially developmental, a paradoxical form of twinning. The biological paradox consists in the fact that the hemihypertrophy is neither double monstrosity nor bilateral duplicity. It is half of each, as though the individual were two conjoined hemi-creatures, each with a discrete though half-realized genetic destiny.

Barbour and Owen, in 1928, reviewed the literature of hemihypertrophy and found that only seven cases had been reported in the American journals. They felt that hemihypertrophy was always congenital and that it might be either partial or complete.

Authors differ as to the etiology of hemihypertrophy. McFarland suggested that the enlargement was due to a pituitary dysfunction, a sympathetic anomaly, or a suprarenal anomaly. Harwood reported a case of hemihypertrophy associated with an enlarged adrenal body on the same side,



FIG 1
Front view



FIG 2
Back view
showing scoliosis

and Hutchison reported a case with post-mortem findings to substantiate the embryonic theory that hemihypertrophy dates back to embryonic life and is the consequence of unequal segmentation in the ovum

The following case of an individual in whom one side of the entire body, including the head, is smaller than the other side, is uncommon and is worthy of being reported

CASE REPORT

A P, a Polish male, fifty years of age, came to the Orthopaedic Clinic at the Hartford Dispensary because of discomfort in the right thigh. The onset of the discomfort was insidious, having begun three months before. The pain was increased by standing and walking, and relieved by rest. There was no muscular stiffness in the morning upon arising and weather changes had no effect on the discomfort. The aching in the right thigh was dull and did not radiate, although there was some associated pain in the right knee. He complained of no pain in the lower back, nor in any of the other joints, and in all other respects he appeared to be in good health.

The patient was the youngest in a family of eight and had been born at the end of seven months' gestation. All of the other children had been born at full term and were healthy. During childhood, the patient had had a severe illness which had been called "fever", but he had recovered without residual effects. His mother had noticed that his right side was larger than the left and that this difference in the two sides of his body had been present since birth. He had had difficulty in running and walking because the right leg, which was longer, always hit the ground when being brought forward. He had attended school in Europe and his mental development had been normal.



FIG 3

Showing difference in size of shoulders and hands

For the past thirty-five years, he had worn a lift on the left heel about one-half an inch in height, and had had no trouble with his back or legs. He had always been obliged to have a large shoulder pad fitted into the left shoulder of his coat and the left arm shortened.

Physical examination showed a small, well-nourished, healthy looking man. Except for the very obvious inequality in the two sides of his body, the examination showed nothing of note. There were no blemishes in the skin. The body measurements were as follows:

	<i>Right</i>	<i>Left</i>
Eyes		
Palpebral fissures	$\frac{3}{8}$ inch	$\frac{1}{4}$ inch
Pupils		Smaller than right
Ears		
Width from helix	1 inch	$\frac{3}{8}$ inch
Length	$2\frac{1}{2}$ inches	$2\frac{1}{4}$ inches

Nose		
Opening of nostril	$3\frac{1}{8}$ inch	$\frac{1}{4}$ inch
Tongue		Deviates to left
Shoulder		
From midsternum	9 inches	$6\frac{1}{2}$ inches
Clavicle length	6 inches	5 inches
Arm		
Humerus	$12\frac{1}{2}$ inches	$11\frac{1}{4}$ inches
Radius	$9\frac{1}{2}$ inches	$8\frac{1}{2}$ inches
Hand		
Length	$6\frac{1}{2}$ inches	6 inches
Width	3 inches	$2\frac{3}{4}$ inches
Legs		
Length	$30\frac{1}{2}$ inches	$29\frac{1}{2}$ inches
Circumference		
Thigh	$15\frac{1}{2}$ inches	$14\frac{1}{4}$ inches
Calf	12 inches	11 inches
Femur	$15\frac{1}{2}$ inches	$14\frac{3}{4}$ inches
Tibia	13 inches	$12\frac{1}{8}$ inches
Feet		
Shoe sizes	size 1	size 12

There was a deviation of the spine to the right of one inch at the sixth dorsal vertebra and a deviation of the spine of the same amount to the left at the second lumbar vertebra

It was felt that the discomfort in the right thigh and knee was entirely mechanical in nature, and was due to the inequality in the length of the legs, which had not been balanced with an adequate lift. The height of the lift on the left heel was, therefore, increased to three-quarters of an inch, and the discomfort promptly subsided

REFERENCES

- BARBOUR, P. F., AND OWEN, W. B. Congenital Hemihypertrophy—Including Report of One Case. *Am. Med.*, XXXIV, 576, 1928
- GESELL, ARNOLD. Hemihypertrophy and Twinning. A Further Study of the Nature of Hemihypertrophy with Report of a New Case. *Am. J. Med. Sciences*, CLXXIII, 542, 1927
- HARWOOD, JOAN. Right Hemihypertrophy and Pubertas Praecox. *Proc. Roy. Soc. Med.* XXV, Part II, p. 951 (Sect. Study Disease Child, p. 65), 1932
- HUTCHISON, ROBERT. A Case of Hemi-Hypertrophy in Which the Internal Organs Were Affected. *Rep. Soc. Study Dis. Child*, IV, 145, 1903-1904
- McFARLAND, B. L. Hemihypertrophy. *British Med. J.* I, 345, 1928

AN OPERATIVE PROCEDURE FOR THE CORRECTION OF EXTERNAL-ROTATION CONTRACTURE OF THE HIP

BY MICHAEL S. BURMAN, M.D., NEW YORK, N. Y.

*From the Hospital for Joint Diseases, New York City **

The author wishes to report a case of external-rotation contracture of the hip, which was corrected by section of the obliquely coursing fibers and tendon of the gluteus maximus, together with stripping of the short external rotators of the hip and posterior capsulotomy of the hip joint. It is a rare deformity and is to be differentiated from the external-rotation position of the hip, operative procedures for the correction of which have been devised by Loeffler, Davis, and Bartow. It is very seldom that external-rotation contracture exists in fixed pelvic obliquity. It is then present on the low side of the pelvis—on the side of abduction contracture—and is due to the secondary abductor action of the gluteus maximus. Dr. Leo Mayer operated in two such cases and found it necessary to ten-

tomize the tendon of the gluteus maximus before the contracture in external rotation was overcome. Early in 1933, the author, independently, devised a plan of release for primary external-rotation contracture of the hip.



FIG 1

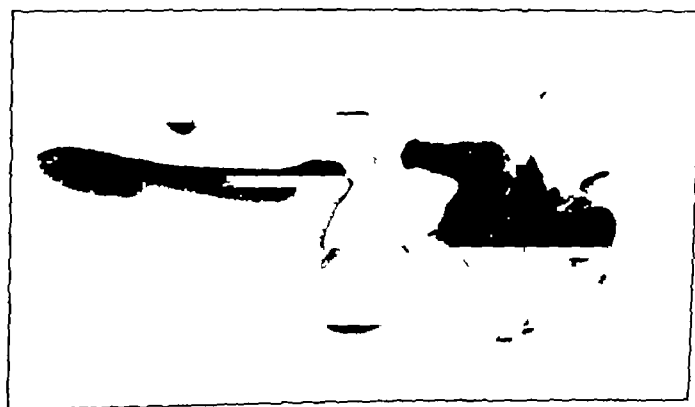


FIG 2

* Service of Dr. Leo Mayer

REPORT OF CASE

P. P. (No. 49930), a boy of twelve, was admitted to the Hospital for Joint Diseases on August 18, 1934. Ever since his birth, he had been paralyzed from the waist down. No adequate history of the boy's early life could be obtained. His mother was in a psychiatric institution and his father did not know the details of the birth history. He had never

walked and had never had any feeling in his lower limbs. Marked deformities of his lower limbs and a very advanced scoliosis had always been present and no one knew how soon after birth they had developed. He had always been incontinent of urine and faeces.

The accompanying photographs (Figs 1 and 2) taken August 18, 1934, illustrate his deformities well. There was a marked right dorsal and lumbar scoliosis, with very marked prominence of the right ribs posteriorly. The left ribs were flattened posteriorly and showed a concavity. The left iliac crest was held one and one-half inches higher than the right. No visible evidence of spina bifida could be obtained. The flexion deformities of both hips and knees are readily seen in the photographs. Both feet were held in fixed equinus. The left femur had been continually held over the right femur, so that the right femur presented a very evident concavity for the reception of the saberlike, anteriorly bowed left femur. The left hip was held in a position of 80 degrees of fixed flexion. *The left thigh was outwardly rotated about 90 degrees, in about 20 degrees of abduction.* This is not too well demonstrated in the photographs and was best seen in attempted straightening of the limbs. This external rotation was due to a fixed, soft-tissue contracture. *No internal rotation was possible.*

There was complete absence of sensation in the lower limbs and in the lower part of the body, the sensory level being at the tenth dorsal vertebra. The neurological consultant believed that a congenital myelodysplasia or a birth injury to the spinal marrow was the cause of the patient's disability.

Roentgenograms showed marked cystlike atrophy of the bones about the knee joint with evidence of previous fractures in the right tibia and right femur near the joint. The spine showed no spina bifida.

The flexion contracture of both hips was relieved by the usual Soutter operation and it was possible to bring the hips into extension. A soft-tissue operation overcame the flexion contracture of the right knee and a supracondylar osteotomy corrected the deformity of the left knee.

The marked outward-rotation contracture of the left hip was now very manifest and it was decided to correct this deformity on the basis of the author's preconceived idea. This was done on October 14, 1934, without any form of anaesthesia.

An eight-inch longitudinal incision was made just posterior to the greater trochanter, extending from about one inch above the level of the greater trochanter, parallel to the shaft of the femur, to about an inch below the tendinous insertion of the gluteus maximus. The subcutaneous tissues were undercut to expose the muscle better. On attempted internal rotation, it was seen that



FIG. 1

the tendon of the gluteus maximus offered great resistance to internal rotation. This tendon was then cut between the clamps. The very atrophic oblique fibers of the muscle were also included. The extent of division of the tendon and muscle reached almost to the greater trochanter. A large part of the external-rotation contracture was now overcome. It is evident that this muscle played the greatest part in the causation of the contracture. Originally, it had been the author's plan to cut the short external rotators, one by one, near their insertion points which center closely on the greater trochanter. There was, however, a more than usual vascularity in the gluteal region and stripping of the external rotators, instead of section, was done. (The author is indebted to Dr David Telson for this suggestion.) A longitudinal incision was made in the periosteum over the trochanter, and the soft tissues in the region of insertion of the short external rotators were carefully stripped back for half an inch or more. The posterior portion of the capsule of the hip joint was cut perpendicularly to the axis of its neck and stripped along its neck. It was now possible to overcorrect the deformity completely. The hip was put in a cast for three weeks in full internal rotation, a position which was easily maintained without any tension whatsoever. The abduction position of the limb offered no difficulty in correction after division of the tendon of the gluteus maximus. Nothing was done to the gluteus medius. The wound healed by primary intention and the postoperative course was uneventful.

An examination of the hip on January 26, 1935, at the time of change of plaster, showed the hip to be in neutral position. The external-rotation contracture had been well overcome.

The spine was corrected by the application of a Hibbs-Risser plaster jacket in lateral flexion, and a rapid and surprising correction of the curve resulted. The spinal fusion was then done.

Figure 3 shows the patient standing for the first time, in the latter part of April 1935. The external-rotation contracture of the left hip has been effectually overcome. The correction of the other deformities has given him good realignment of his body.

REFERENCES

- BARTOW, BERNARD. The Further Application of the Intra-Articular Silk Ligament in the Flail Joints of Poliomyelitis Paralysis. *Am J Orthop Surg*, XIV, 217, Apr 1916.
- BARTOW, BERNARD, AND PLUMMER, W. W. The Operative Procedures Employed in the Treatment of the Residual Paralysis of Poliomyelitis at the Children's Hospital, Buffalo, N. Y. *Am J Orthop Surg*, XIV, 594, Oct 1916.
- DAVIS, G. G. Stability of the Lower Extremity in Paralytics. *Am J Orthop Surg*, XIV, 391, July 1916.
- LOEFFLER, FRIEDRICH. Zur operativen Behandlung der fehlerhaften Auswärtsdrehung des Hüftgelenks nach spinaler Kinderlähmung. *Zentralbl f Chir*, XLIX, 1715, 1922.
- MAYER, LEO. Fixed Paralytic Obliquity of the Pelvis. *J Bone and Joint Surg*, XIII, 1, Jan 1931.

FUSION OF A KNEE JOINT IN CHARCOT'S DISEASE

REPORT OF A CASE

BY MATHER CLEVELAND, M D , NEW YORK, N Y

In 1931, Cleveland and Smith¹ reported four cases of Charcot's disease of the knee joint in which fusion had been attempted, with success in three instances. The following case is reported as further evidence that the procedure is possible although it may be difficult of attainment.

E S (No 3548), a colored woman of forty-six years was admitted to Sea View Hospital on July 27, 1930, with a history that four months before admission she had fallen down a flight of stairs and had injured her right knee. The knee became increasingly swollen, but it was painless. The patient had been treated for rheumatism at a hospital clinic.

Physical examination showed a right knee joint which was considerably swollen, without tenderness or heat. The range of motion was markedly increased in all directions to almost complete instability. There was lateral motion. On weight-bearing, the knee went into hyperextension. The patient was able to walk without the aid of a cane. The roentgenograms (Fig 1) showed marked disintegration of the joint with a considerable amount of bony detritus.

The lungs showed no evidence of active pulmonary disease. The heart examination suggested a mitral stenosis with good compensation. The results of the Wassermann test were as follows: blood, two plus, spinal fluid, three plus.

A diagnosis of Charcot's disease was made on admission and, on August 8, 1930, a fusion of the right knee joint was attempted. The joint contained about fifty cubic centi-



FIG 1

Showing the disintegration of the knee joint with a good deal of bony detritus. There is marked swelling and distention of the capsule.

*FIG 2*

Roentgenograms, two and one-half years after first operation, showing the pseudarthrosis at the knee joint with marked cupping of the tibia

*FIG 3*

Roentgenograms, eighteen months after the second operation, showing bony fusion of the knee joint



Fig. 1
Showing a destructive lesion in the lumbar spine, including the second, third, fourth, and fifth lumbar vertebrae, the fourth and fifth bodies have collapsed and are in contact. A definite picture of Charcot's disease of the spine.

meters of hemorrhagic fluid. The normal anatomical structure of the joint was found to be almost completely destroyed. The debris was removed, the articular surfaces were denuded, and the patella was used as a peg to fit into a prepared mortise in the femur and tibia. Tissue removed showed chronic synovitis with obliterating arteritis.

The postoperative course was uneventful and, during her entire stay in the hospital, the patient wore a plaster-of-Paris dressing on the leg. In June 1931, ten months after operation, there was no evidence of fusion and the patient left the hospital against advice.

On December 14, 1932, the patient was readmitted to Sea View Hospital with the history that she could barely get around on crutches, due to the marked instability of the knee joint. The right leg was a little over an inch short, with considerable atrophy. The knee joint was markedly unstable, without pain or tenderness.

The roentgenograms of January 6, 1933, (Fig. 2) showed a marked cupping of the upper end of the tibia and a rounding of the femur. The patella had completely disappeared, but no progressive destruction of the joint was noted.

On January 26, 1933, a second operation was performed to repair the pseudarthrosis. A definite false joint was found with the articulating surfaces covered by fibrous tissue. The bone ends were excised well back to raw, apparently healthy bone, and sliding grafts were applied across the joint space from the femur to the tibia. The tissue removed at the second operation showed a great deal of dense connective tissue in which the capillaries presented extensive endothelial proliferation and some perivascular round-cell infiltration. The diagnosis was granulation tissue, probably syphilitic. A plaster-of-Paris spica dressing was worn for three to four months, followed by the application of a plaster-of-Paris dressing to the leg only. This dressing was not finally removed until June 1934, seventeen months after operation. The patient bore weight during the last seven or eight months of this period.

At the time of the removal of the plaster in June 1934, the knee joint was found to be solidly fused clinically and the roentgenograms of June 13, 1934, showed bony fusion (Fig. 3).

During her first stay in the Hospital, the patient was given a course of antiluetic treatment and, on second admission, the blood Wassermann was plus-minus.

During the second period of hospitalization, there was noted a lower lumbar kyphosis without pain or muscle spasm. The roentgenograms of the lumbosacral spine of July 23, 1934, (Fig. 4) showed a destructive lesion involving the second, third, fourth, and fifth lumbar vertebrae, the fourth and fifth vertebrae had collapsed and were in contact. In the absence of pain, tenderness, or spasm, this was almost certainly Charcot's disease of the spine.

At present, the patient has a fused right knee which is straight. However, the leg is three inches short, owing to the necessity of removing so much eburnated bone at the two operative procedures. The patient is walking with an extension shoe, without a brace for the leg. Her spine at present causes no trouble, but may require the wearing of a brace.

COMMENT

This case is presented as demonstrating a successful knee fusion in Charcot's disease after one failure to obtain fusion. The period of immobilization after the second operation was about seventeen months, seven months longer than after the first operation. This may have been a determining factor plus the fact that at the second operation a further resection of the bone ends made it possible to get in contact bones of more nearly normal structure. Had we been able to anticipate the development of disease in the spine it is doubtful if we should have attempted the second operation on the knee.

- 1 CLEVELAND, MATHER, AND SMITH, ALAN DeFOREST. Fusion of the Knee Joint in Cases of Charcot's Disease. Report of Four Cases. *J. Bone and Joint Surg.*, XIII, 849, Oct. 1931.

SCHÜLLER-CHRISTIAN DISEASE (XANTHOMATOSIS)

A CASE REPORT

BY S K LIVINGSTON, M D , F A C S , HINES, ILLINOIS

Schüller-Christian disease (xanthomatosis of the skeletal type, dysostosis hypophysaria) is a rare, probably familial constitutional disorder of metabolism in which a deposition of lipoids, particularly cholesterol and its ester, takes place. According to Rowland¹, this deposition leads to a characteristic hyperplastic reaction in the reticulo-endothelial system, resulting in Christian's syndrome, — *i e*, defects in the membranous bones, exophthalmos, and diabetes insipidus.

Davison² summarized forty-nine of the sixty cases reported in the literature as follows:

Defects of the skull were present in all cases except two. These defects were found most frequently in the parietal bones, the sella turcica, and the orbits. Diabetes insipidus, next in frequency, occurred in thirty-six cases. Exophthalmos was present in thirty cases. Gingivitis and defective teeth were recorded in seventeen cases. Decrease in growth and mental development were noted in half the cases, while secondary retrogressive sexual characteristics, belonging to the dystrophia adiposogenitalis group, were observed in a few. A number of cases showed an increase in blood cholesterol and total fat.

Histopathologically, the disease is characterized by a diffuse collection of lipid-laden histiocytes, known as xanthoma or foam cells. As the process develops, connective-tissue fibrosis replaces the foam cells in various organs of the body. The granulomatous collections within the skull and dura give rise to neurological symptoms described by Davison. Fibrosis is most noticeable in the lungs and is the most frequent cause of death.

The following case presents the rare and protracted form of the affection as manifested in an adult, and for this reason is reported.

CASE REPORT

L W B (No 58783), a white male, aged thirty-seven, a machinist, was admitted to the hospital on January 9, 1935, complaining of headache, dizziness, lumps on top of the head, and urgency and frequency of urination.

The patient had had the usual diseases of childhood, he denied venereal infection, drug addiction, or excessive use of alcohol. There was no history of operations. The family history was essentially negative.

The patient stated that he had suffered from urgency and frequency of urination with nocturia for fifteen years. There had been no dysuria or hematuria. For the past twelve years lumps on the top of his head had grown slowly, causing an increasing irregularity of the skull. Headaches, which had occurred at intervals for the past two or three years, had, during the past three months, been severe. He described the pain as a pressure sensation on the top and right side of the head, associated with frequent attacks of dizziness. There had been no disturbance of eyesight. During the three months prior to admission, he had lost ten pounds.

Physical Examination

Examination revealed a tall, well-developed, somewhat undernourished male, who was not seriously ill

Skull On examination of the vertex, there was marked irregularity. On palpating the surface of the skull, the finger dipped into four tender depressed areas, evidently produced by bone necrosis. These depressed areas gave the impression of being surrounded by nodules, but, on close observation, there were only excavations, occupying an area nearly the whole vertex. In the parietal bone near the occipital region there were two similar smaller areas.

Chest and Lungs The chest was long, of medium depth, and broad. Mobility was fair and equal. There were no percussion nor auscultatory changes.

Cardiovascular System The arteries were soft. The heart was normal in size and position, there were no thrills nor murmurs. The pulse rate was 72. The blood pressure was 94/60.

Digestive System The abdomen was flat and soft, with no masses nor tenderness. The liver, spleen, and glands were negative. There were no hemorrhoids.

Genito-Urinary System Examination of the genito-urinary system was negative.

Neurological Examination

The pupils were equal and regular, and reacted equally to light and accommodation. There was no exophthalmos, but the right eye was slightly prominent. All extra-ocular movements were well performed. There was no optic atrophy nor papilloedema. Movements were perfect in all extremities. There was no ataxia nor involvement of the cranial nerves. Reflexes were present equally and normally.

Roentgenographic Report

Skull and Face The bones of the skull and face revealed destruction of the inner and outer tables of the left parietal bone in the region of the supratemporal line. There was

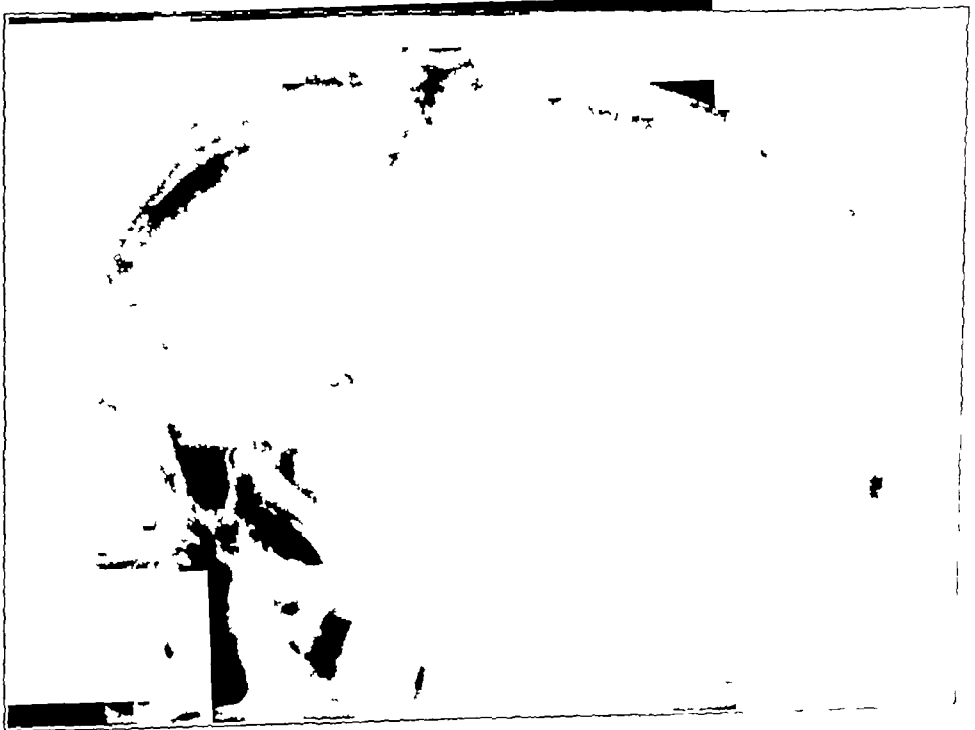


FIG 1

Roentgenogram of the skull, showing destruction of the inner and outer tables of the left parietal bone in the region of the supratemporal line. There is also a shadow line crossing the frontal bone in the region of the median line, suggesting a fracture.

also a shadow line crossing the frontal bone in the region of the median line, suggesting a fracture (See Figure 1)

In the skull there were seen a number of areas of bone destruction, with no definite osteoplastic reaction. Immediately above the right eye and involving the roof of the orbit, there was a defect about thirteen millimeters in diameter, which was not as pronounced as the others. In the left parietal region, there was a defect which measured two centimeters by three and five-tenths centimeters. At the vertex, there were three defects,—two placed in the midline and the third, one centimeter to the left of the sagittal suture. These measured in diameter two, three, and one and five-tenths centimeters, respectively. There was also a linear fracture of the skull, beginning at a point about one and one-half inches above the nasion and extending in the sagittal plane upward for a distance of three inches. In the skull, there were no zones of calcification. The sella turcica was of normal size, shape, and position and the sinuses showed no clouding.

Spine and Pelvis The bodies of the vertebrae were regular in outline, the intervertebral spaces were of normal and even width. There was an os acetabuli on the right and a spina bifida occulta of the first sacral segment.

Chest The lung fields were radiant throughout all the lobes, the apices and peripheral zones were clear.

Long Bones The long bones showed no anatomical nor pathological variation from the normal.

Laboratory Studies

Blood Analysis

Red blood corpuscles—4,600,000 per cubic millimeter

White blood corpuscles—10,000 per cubic millimeter

Hemoglobin—85 per cent

Color index—0.89

Differential white-cell count

Polymorphonuclear leukocytes—65

Lymphocytes—33

Monocytes—2

Blood cholesterol—235.3 per 100 cubic centimeters

Blood sugar—102.0 per 100 cubic centimeters

Blood calcium—10 per 100 cubic centimeters

Non-protein nitrogen—32.1 per 100 cubic centimeters

Urea nitrogen—17.3 per 100 cubic centimeters

Creatinin—1.4 per 100 cubic centimeters

Complement fixation—negative

Urinalysis

Color—amber

Reaction—acid

Specific gravity—1.013

Albumin—slight trace

Sugar—negative

White blood cells—few

Red blood cells—none

Casts—fine granular

Bence-Jones bodies—negative

Spinal Fluid

Appearance—clear

Globulin—negative

Cells per cubic millimeter—8

Dextrose—0.070 per cent

Wassermann test—negative

Acetic anhydride sulphuric acid test—negative

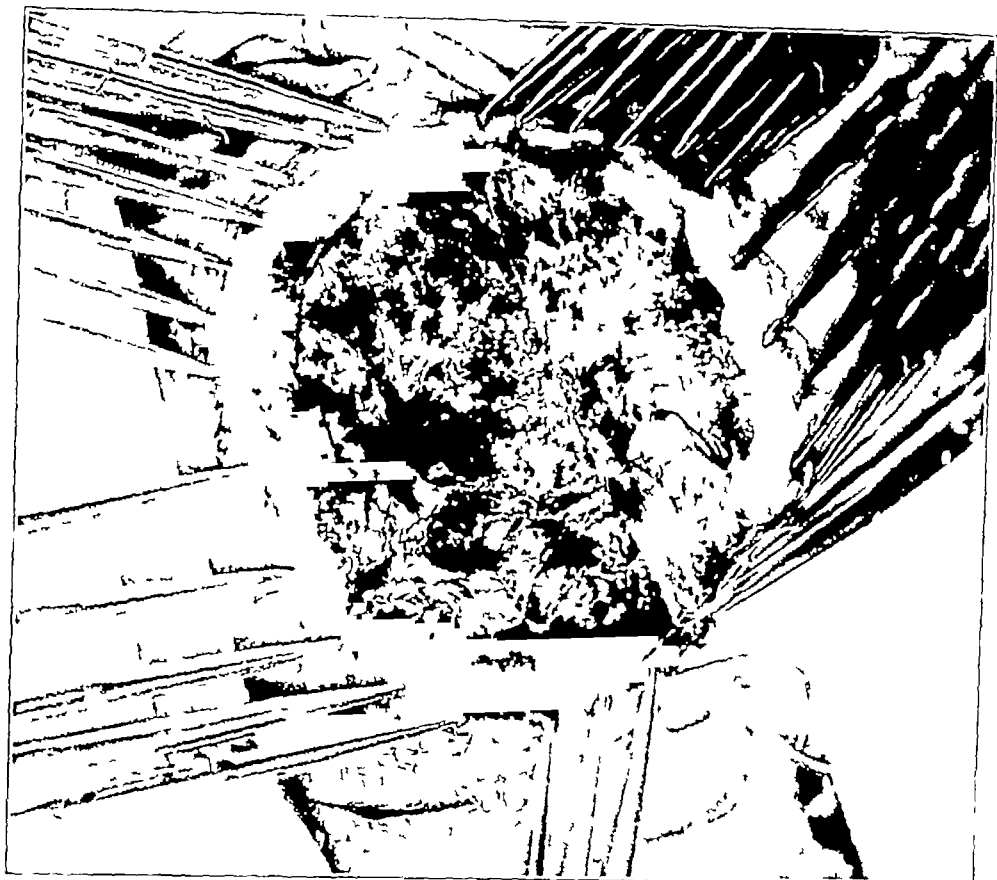


FIG 2

The left parietal bone after surgical reflection of the scalp, showing rough, irregular, and eroded areas. Through the eroded openings, nests of xanthoma cells could be identified grossly.

Operation

A semicircular incision was made around the largest of the depressions in the skull. The scalp was then easily reflected. Beneath was an irregular rough bone, eroded in several areas to membrane thinness. In one area, both tables had been completely eroded and, through the opening, the appearance was that of a nest of whitish-yellow fish eggs. This area was in the midline, partly covered the superior longitudinal sinus, and was thought to be xanthomatous (Fig 2). A biopsy specimen (Fig 3) was taken to distinguish the eggs from pacchionian bodies.

DISCUSSION

In the differential diagnosis, the following conditions have to be considered: Paget's disease, osteoporosis circumscripta, multiple myeloma, hyperparathyroidism, metastatic osteoclastic carcinoma, and xanthomatosis.

1. Paget's disease may be ruled out because of the absence of thickening of the skull. There are also not seen the coarse mottling and increased trabeculation. Then again, there is no involvement of any other bones in the body. The blood calcium in this instance shows no variation from the normal.

2. Osteoporosis circumscripta may be rejected, first, because of the multiplicity of the lesions. Then again, it is frequently found with typical Paget's disease in other bones.

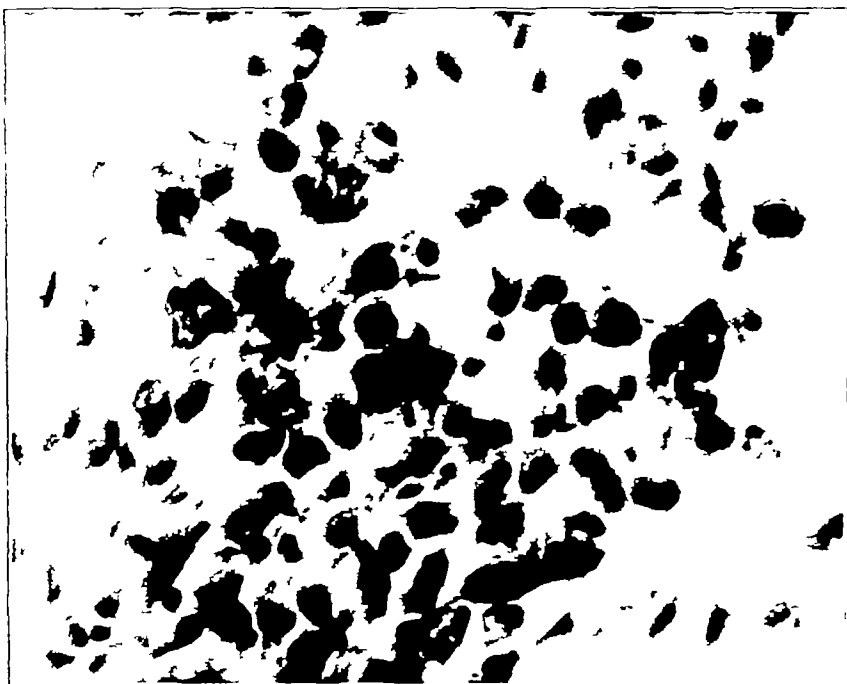


FIG 3

A biopsy section characterized by lipid-laden histiocytes known as xanthoma cells or foam cells, surrounded by fibrosis

3 Multiple myeloma may be excluded because of the absence of bony changes elsewhere, combined with the absence of subjective findings such as pain and weakness. There is also no evidence of the usual findings of Bence-Jones protein, progressive anaemia, and a chronic nephritis without retention and increased blood pressure.

4 Hyperparathyroidism may be eliminated because of the lack of systemic involvement. There is not found here the uniform milky and granular mottling, with thinning of the cortex and the delicate and indistinct trabecular pattern. There is also no evidence of renal calculi.

5 Osteoclastic metastatic carcinoma may be ruled out, first, because of the clear-cut appearance of the areas of bone defect, as contrasted with the fuzzy, irregular borders seen in carcinoma. The history and the physical examination also do not suggest malignancy.

CONCLUSION

In this case, the history given is not absolutely typical of Schüller-Christian disease. There was a history of frequency of urination, somewhat periodic in character, with at times passage of large amounts of urine. There had been no excessive thirst, but the patient stated that he drank quite a bit of water. There had been no pain nor tenderness. The patient did, however, complain of headache, and gave a history of injury to the head. There was present no exophthalmos, but the right

eye appeared slightly prominent. The lesions were confined to the head. The blood cholesterol was very considerably raised (235.3 milligrams), while the blood calcium was normal. In view of these findings, the condition is believed to be one of xanthomatosis (Schüller-Christian disease or lipoid histiocytosis).

REFERENCES

- 1 ROWLAND, R. S. Xanthomatosis and the Reticulo-Endothelial System. Correlation of an Unidentified Group of Cases Described as Defects in Membranous Bones, Exophthalmos and Diabetes Insipidus (Christian's Syndrome). *Arch. Int. Med.*, XLII, 611, 1928.
- 2 DAVISON, CHARLES. Xanthomatosis and the Central Nervous System (Schüller-Christian Syndrome). *Arch. Neurol. and Psychiatry*, XXX, 75, 1933.

FRACTURE OF THE NECK OF THE FEMUR

REPORT OF A CASE WITH RAPID UNION FOLLOWING EARLY WEIGHT-BEARING

BY SAMUEL KLEINBERG, M D , NEW YORK, N Y

The following case of fracture of the neck of the femur is reported because weight-bearing was permitted promptly after the reduction and, the author believes, contributed materially to the unusually early and solid union. If the result obtained in this case can be duplicated*, we may have an additional principle in the treatment of fractured hips which may increase the percentage of cases in which union is obtainable by conservative measures, and which, by dispensing with prolonged rest in bed will dispel the fear of hypostatic pneumonia, pressure sores, and the enervating effects of inactivity.

M B, male, sixty-four years old, was admitted to the author's Service at the Hospital for Joint Diseases on February 23, 1934. The patient had fallen the day before and had sustained a transcervical fracture of the neck of the right femur (Fig 1). The man's general condition was exceedingly poor. He had a myocarditis and nephritis. The prognosis seemed very poor. Since the patient was totally disabled and in constant pain, the author felt that he could not possibly be made worse by a treatment which, by supporting the fractured area, would at least relieve him of pain.

Under ethylene anaesthesia, the limb was rapidly manipulated, the Leadbetter modification of the Whitman abduction technique was employed. Three attempts were made before the fractured surfaces were finally locked and the "heel-palm" test was positive, indicating satisfactory reduction. The limb was immobilized in about 25 degrees of abduction. A spica bandage was applied, with only moderate padding over the trunk and upper thigh, and no padding over the lower thigh and the leg, as Leadbetter advises. The whole procedure—manipulation and application of the spica—took fifteen minutes, and the patient showed no ill effects. As a matter of fact, directly after the operation, the patient was very cheerful because he was free from pain. A subsequent roentgenogram (Fig 2) showed a satisfactory realignment and intimate contacting of the femoral head and neck.

It then occurred to the author that, inasmuch as the fragments were securely fixed, because the plaster spica was thoroughly molded over the iliac crests and applied directly to the skin of the thigh and leg it might be possible to get the patient out of bed several times a day, to hold him in the upright position, and, perhaps, to let him bear some weight on the broken limb. By so doing the problem of hypostatic pulmonary congestion could be controlled. Moreover, should weight-bearing be tolerable, friction of the apposed fractured surfaces would stimulate healing. Not only was this man able to stand up with the aid of crutches, but, by the eighth day after operation, he walked around the ward without assistance other than his crutches. He bore some weight on the broken limb and had no pain in it. Far from being aggravated his general condition was improved by the freedom from suffering and the prospect of an early cure.

The patient was discharged from the Hospital fifteen days after admission and got along very well at home, requiring only a little help.

Two months later, he returned to the Hospital. The plaster was removed and the

* Since submitting this report, the author has obtained equally satisfactory results in three additional cases, one of which was that of a woman ninety-four years old.



Fig 1
Transcervical fracture of right hip, with moderate displacement of the fragments



Fig 2
Postoperative x-ray, taken through a plaster spica and showing a satisfactory realignment of the fragments of the neck of the femur

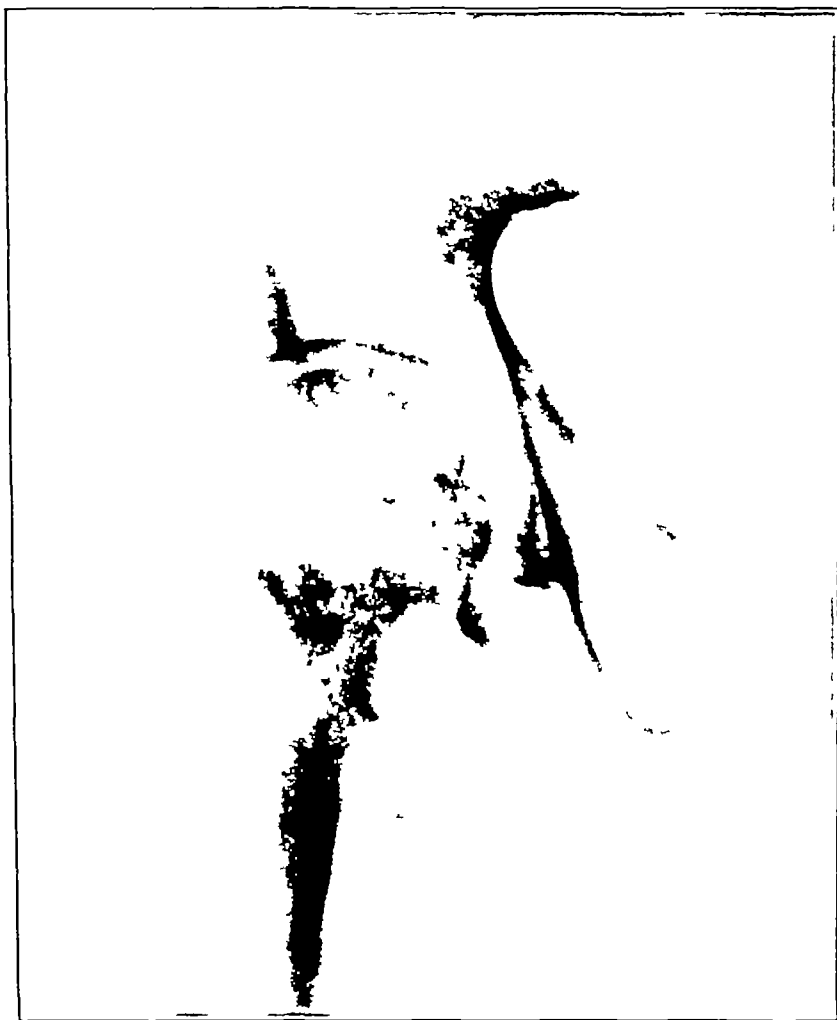


FIG 3

X-ray of right hip, taken seven months after the original injury and showing good alignment of the cervical fragments and solid union at the site of fracture

clinical and x-ray examinations showed that the fracture was apparently healed. A short well-fitting spica was applied, and the patient was sent home and encouraged to bear considerably more weight on the injured limb.

One month later, the fractured area appeared to have healed and a canvas spica was provided and physiotherapy begun. Two months later—that is, five months after the injury—he was able to walk quite freely and without pain. The range of motion in the hip gradually increased. The use of the canvas spica was continued.

In the latter part of September 1934, seven months after the injury, an x-ray (Fig. 3) showed solid union, with good alignment of the head and neck. The patient used only a cane in walking and required no assistance. A more recent examination, December 13, 1934, showed that he walked with a barely perceptible limp. There was no shortening and all but perfect motion.

COMMENT

The author realizes that the results obtained from any kind of treatment in one case do not warrant the drawing of any broad conclusions, but he believes that, in the case of this patient who was a bad surgical risk, the departure from the traditional routine of long hospitalization, together with early weight-bearing, has helped to bring about a particularly satisfactory result. It may be that this principle of early weight-bearing, when applied to fresh fractures of the neck of the femur which have been accurately reduced, may serve to raise appreciably the present low percentage of bony unions.

FRACTURE OF THE ANTERIOR-SUPERIOR SPINE OF THE ILIUM *

BY ROBERT CRAWFORD ROBERTSON, M D , F A C S , CHATTANOOGA, TENNESSEE

From the Department of Orthopaedic Surgery, Baroness Erlanger Hospital

In 1933, Christopher ¹ reviewed all reported cases of fracture of the anterior-superior spine of the ilium and added one case of his own, bringing the total to forty-five. Four subsequent reports have appeared.² Fracture of the anterior-inferior iliac spine has also been reported.³

The majority of cases of avulsion of the anterior-superior spine have occurred in athletic males prior to the age of union of the epiphysis of the iliac crest. Usually this condition has followed strenuous muscular effort or sudden unguarded movement, and it is generally classed as a sport injury resulting from direct muscle pull. End results have been uniformly excellent. Good anatomical reduction has not been demonstrated by conservative treatment, although the period of disability has been stated to be less than in cases treated by open reduction.

The following cases are considered worthy of report because of the apparent rarity of the condition and the opportunity which was presented to compare carefully the merits of different types of treatment.

CASE 1 H B, white male, fifteen years of age, a student, was admitted on April 23, 1934, because of pain in the region of the right anterior-superior iliac spine and inability to walk. Two hours previous to admission, after covering about half the distance in the 100-yard dash, he had felt a sudden severe pain in the region of the right hip, which had caused him to sit down. The pain had occurred while the left foot was advanced, with the right foot to the rear, supporting the greater portion of his weight. The pain had been very severe on all attempts to move the right hip and had prevented his rising from the ground or bearing weight after he had been assisted to his feet.

One week previous to admission, while wrestling, he had been kicked in the region of the right anterior-superior iliac spine. Slight local soreness had been present for two or three days, following which he had been symptom-free. Otherwise, the past history was essentially negative. He was unusually muscular and his development equalled that of an athlete several years older.

Local examination revealed no evidence of external injury. There was slight swelling, tenderness, and palpable crepitus in the region of the right anterior-superior iliac spine. Symptoms were increased by all attempts at active motion of the right hip. Active flexion and rotation could not be performed. X-ray examination revealed a fracture of the right anterior-superior iliac spine with displacement of the fragment laterally and distally.

The hip and knee were supported in flexion with back rest and pillows. The fragment could be replaced by manipulation, but reduction could not be maintained. Complaint of pain continued to be marked.

Three days later, the fragment was exposed under ether anaesthesia. It was found to be displaced distally about two and five-tenths centimeters and measured approximately two centimeters by one and two-tenths centimeters by seven-tenths centimeter.

* Read before the Chattanooga Surgeons Club Chattanooga, Tennessee March 12, 1935.



FIG 1

Case 1 Fracture of right anterior-superior iliac spine Before reduction

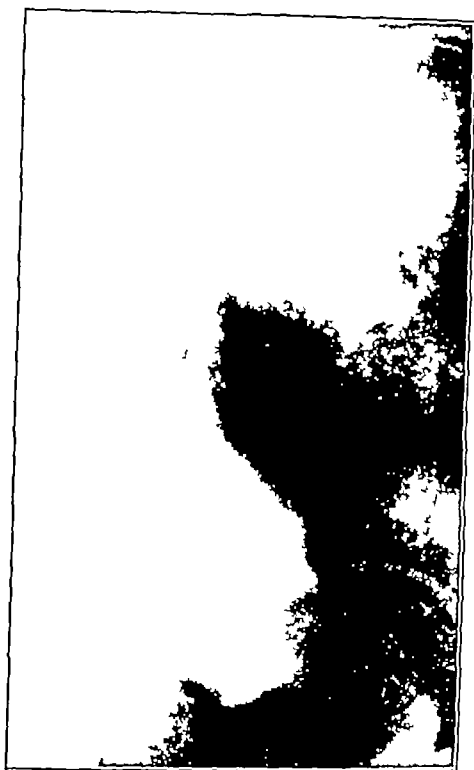


FIG 2

Case 1 End result after open reduction and nailing of fragment

The edges were serrated. To the fragment were attached the origin of the sartorius and the lateral end of the inguinal ligament. At the proximal end of the fragment, the fibers of the obliquus externus abdominis were completely separated for a distance of two centimeters. The fragment was replaced by flexing the hip, and was retained with a small wire nail. A spica cast was applied with the hip and knee in flexion.

The patient was unable to return for treatment until seven weeks after the operation, at which time the nail and cast were removed. X-ray examination showed good union with slight displacement. Crutches were used for two weeks. School activities were resumed on the sixty-fourth day following injury, handball, basketball, and wrestling were engaged in one month later. During the fall of 1934, the patient played football, and now runs regularly five miles in slightly less than thirty minutes. No abnormality in range or power of hip motion nor palpable displacement of the fragment can be detected.

CASE 2 * R. C., white male, twenty-one years of age, a messenger boy, was admitted on October 25, 1934, with a tentative diagnosis of fracture of the left anterior-superior spine of the ilium. About four hours previous to admission, while riding a bicycle, he had been forced off the road by an approaching car. His bicycle had skidded in gravel, causing him to fall to the left and to strike on the left-hip region and both hands. The position of the left lower extremity could not be recalled, except that both feet had remained on the pedals. On attempting to rise, he had felt soreness in the region of the left anterior-superior iliac spine of such severity that he had been prevented from mounting his bicycle. He had pushed the bicycle about five blocks with appreciable pain and had then climbed stairs to the second floor of his home with considerable local pain, which was decreased by climbing with the left knee fully extended. He had been examined in his home by Dr. Record a short time later, and had been removed to the hospital by ambulance.

* Patient of Dr. W. D. L. Record



FIG 3

Case 2 Fracture of left anterior-superior iliac spine Before reduction

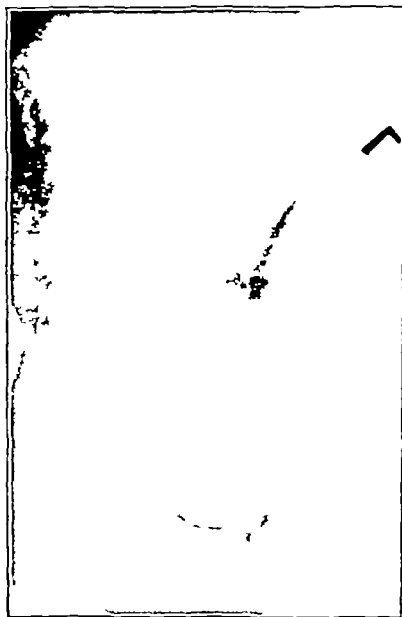


FIG 4

Case 2 End result after conservative treatment

On local examination, no evidence of external injury was seen. Slight active hip flexion and rotation were present, but painful. Slight swelling, marked tenderness, and palpable crepitus were present in the region of the left anterior-superior spine. The patient was quite muscular, and presented no other evidence of bone pathology. The past history was irrelevant. The x-ray showed a fracture of the anterior-superior spine of the left ilium with distal and lateral displacement of the fragment.

A spica cast was applied with the hip flexed and adducted and the knee flexed. After one month this was removed, when slight local discomfort was experienced on weight-bearing. Crutches were used for three weeks. The patient returned to full duty on the sixty-eighth day following the accident and resumed boxing, wrestling, and roller skating one month later. There has been no subsequent local complaint. A small bony mass, slightly distal and lateral to the anterior-superior spine, is palpable. All motions in both hips are equal in range and power.

SUMMARY

1 Fracture of the anterior-superior spine of the ilium, apparently the result of muscle violence, may result in a wide variation in the immediate severity of symptoms and degree of disability.

2 Surgical and conservative methods of treatment produced practically equal periods of disability and identical functional results.

REFERENCES

- 1 CHRISTOPHER, FREDERICK. Fracture of the Anterior Superior Spine of the Ilium. *J. Am. Med. Assn.* C, 113, 1933.
- 2 RUTKOWSKI, J. A Case of Fracture of the Anterior Superior Spine of the Ilium from Muscular Exertion. *Chir. Narz. Ruchu*, V, 93, 1932.

- BORKOWSKI, W Avulsion Fracture of the Anterior Superior Spine of the Ilium
Chir Narz Ruchu, V, 473, 1932
- STRAUSS, FRITZ Zur Kenntnis der Abbrüche des vorderen oberen und unteren
Darmbeinstachels Arch f Orthop u Unfall-Chir, XXXII, 478, 1933
- BOLLAG, LOUIS Abriss der Spina iliaca ant sup, eine typische Sportverletzung
Schweizerische Med Wehnschr, XIV, 188, 1933
- 3 CORLETTE, C E Fracture of the Anterior Inferior Spine of the Ilium Med J
Australia, II, 682, 1927
- PEZCOLLER, A Le fratture della spina iliaca anteriore inferiore Clin Chir, VII,
249, 1931
- ROTHBART, LADISLAUS Abrissfraktur der Spina iliaca ant inf Zentralbl f Chir,
LIX, 781, 1932
- HANKE, HANS Zur Kenntnis der isolierten Abrissfraktur der unteren Spina anterior
ossis ilei Arch f Orthop u Unfall-Chir, XXXI, 377, 1932

A NEGLECTED FACTOR IN THE ETIOLOGY OF GOUT

BY JOSEPH KRAFKA, JR., M.D., AUGUSTA, GEORGIA

University of Georgia, School of Medicine

Medical interest in the etiology of gout has bidden fair to outlive the disease itself. It is just possible that this ancient and honorable ailment "that has killed more rich men than poor, and more wise men than fools", will pass from medical ken during the present depression, together with our wit and wealth.

Williams¹ has called the history of gout "a reproach to medicine". The cause of the disease has always been obscure. Williamson², in 1920, found a familial history in only twelve of his 116 cases. In only 9.4 per cent was there a remote possibility of lead poisoning. Syphilis occurred in only 15 per cent, and a true nephritis in only 7 per cent. Fifty per cent of his patients were "heavy drinkers", and but 4 per cent were "teetotalers".

Gout shows three characteristics: it is afebrile with temperatures rarely exceeding 100 degrees, it is spontaneous, and it involves the metabolism of uric acid. The one reason that a rational explanation has not been forthcoming is due to the fact that there has been an oversight in the recognition of the source of endogenous uric acid.

In 1929, the author³ presented experimental evidence that the endogenous uric acid arose from the destruction of the extruded nuclei of the normoblasts in the maturation of the red blood cells. The origin of uric acid from nuclear material had long been accepted, but sources sufficient to account for daily eliminations when the subjects were on purine-free diets, had not been previously indicated.

From a base level of 154 milligrams, a Dalmatian coach-dog eliminated an average of 302 milligrams of uric acid after severe hemorrhage, as the red-blood count rose from 3,300,000 to 6,360,000. In a later test, after hemolysis with phenylhydrazine hydrochloride, the base level rose from 265 milligrams to 481 milligrams. At the same time, the reticulocytes (young red blood cells) increased from 0.4 per cent to 3.6 per cent. Further tests show a complete correlation between output of uric acid and marrow behavior.

On theoretical grounds, there has been indicated a quantitative relationship between the normal daily activity of the hemolytic-hematopoietic system and the normal daily excretion of uric acid.

This thesis has been independently defended by Riddle⁴ in his study on uric-acid outputs in patients with pernicious anaemia. He found that potent extracts of liver which stimulated red-cell production also increased the uric-acid outputs. Non-potent extracts had no effect. The author has found confirmatory evidence in cases of secondary anaemias.

Uric acid is thus definitely associated with the marrow system, and the relationship of gout to the epiphyseal cartilages and ends of the long bones is of more than passing interest. Any condition which tends to stimulate the erythropoietic system becomes an important factor in the overproduction of uric acid and, thus, a potential etiological agent in gout. With this in mind, a review of two recently reported cases will be of interest.

Sears⁵ cites the case of a man, forty-nine years of age, with pernicious anaemia. He had a red-blood count of 1,650,000, hemoglobin, 31, and reticulocytes, 0.6 per cent. On a liver diet the patient showed an immediate response, so that the reticulocytes reached 11.4 per cent in four days. Thirty days later, he came down with a typical attack of gout.

Fitz⁶ records the case of an old man, seventy-five years of age, who had had gout as far back as he could remember. He presented himself for treatment, not for the gout, but for an ulcerated stomach. Clinical examination further showed a low-grade anaemia, the red-blood count was 1,800,000. The patient was put on a diet for the ulcerated stomach and was treated with iron and liver extract for the anaemia. After the patient had been on a routine diet of liver extract for a month, during which time the red-blood count gradually rose to 3,420,000, it was thought advisable to stimulate his erythropoiesis by an injection of liver extract. This procedure caused the patient to come down with an attack of gout, the worst that he had experienced in all of his seventy-five years.

The results observed in both of these cases are thoroughly in accord with the author's hypothesis and follow in logical sequence,—marrow stimulation, overproduction of uric acid, gout.

Another phenomenon which has hitherto been obscure is the association of the "gouty diathesis" with polycythaemia. Llewellyn⁷ reports several such cases in which the red-blood counts were 7,000,000. Here again is an "unbalanced marrow" conducive to periodic overproduction of uric acid.

The obscure relationship between gout and lead poisoning lacks much of its mystery when it is remembered that lead is a very active hemolytic agent, and that every low blood count is compensated for by an increased marrow activity.

The spontaneity, afebrile character, and the tendency to become polyarticular all fit in with our hypothesis. Hench's patients⁸ showed typical attacks of gout, three days after indiscretions during the Feast of the Passover. Marked uric-acid outputs have occurred in the experimental animals immediately after hemorrhage or hemolysis, reaching a peak in about three days.

We are not in a position to say why gout does not occur in all cases of increased uric-acid production, but we may explain the disappearance of the old-fashioned gout of 100 years ago on the basis of the discontinuance of the medical practice of "bleeding", since even small hemorrhages are marked hematopoietic stimuli.

By directing attention to the principal source of the offending agent, uric acid, a more satisfactory treatment of gout is possible. All hemolytic and hematopoietic agents should be used with discretion. In determining

whether or not such agents are indicated, the normal reticulocyte count of 0.5 per cent should be the guiding factor

In closing this paper, the author would emphasize the fact that gout is not a dead disease. Of the 116 patients presenting themselves for treatment at the Cook County Hospital over a period of six years, Williamson² states that only twenty-nine had been previously diagnosed as having gout. Thus the "foot-ail" or podagra, from which Harvey, Sydenham, Hunter, Washington, Hancock, Pitt, Fox, and other notables suffered, now goes about disguised under other names.

REFERENCES

- 1 WILLIAMS, RENDELL. Historical Medicine. Gout. The Reproach of Medicine. Med J and Record, CXXXV, 143, 1932.
- 2 WILLIAMSON, C. S. Gout. A Clinical Study of One Hundred and Sixteen Cases. J. Am. Med. Assn., LXXXIV, 1625, 1920.
- 3 KRAFKA, JOSEPH, JR. Endogenous Uric Acid and Hematopoiesis. J. Biol. Chem., LXXXIII, 409, 1929.
Endogenous Uric Acid and Hematopoiesis. II. Uric Acid, Reticulocytes, and Erythrocytes after Hemolysis by Phenylhydrazine Hydrochloride. J. Biol. Chem., LXXXVI, 225, 1930.
Endogenous Uric Acid and Hematopoiesis. III. Uric Acid Outputs and Reticulocyte Counts as Affected by Glycerine, Caffeine, Urea, Bilirubin, Atophan, and Xylose. J. Lab. and Clin. Med., XVII, 428, 1932.
- 4 RIDDLE, M. C., AND STURGIS, C. C. The Endogenous Uric Acid Metabolism in Pernicious Anemia. J. Clin. Investigation, VII, 498, 1929.
- 5 SEARS, W. G. The Occurrence of Gout during the Treatment of Pernicious Anemia. Lancet, I, 24, 1933.
- 6 FITZ, REGINALD. Three Cases with Intermittently Painful Joints, Splenomegaly and Anemia. Case I. Gout. Med. Clin. North America, XVIII, 1053, 1935.
- 7 LLEWELLYN, L. J. Gout. St. Louis, C. V. Mosby Company, 1921.
- 8 HENCH, P. S., AND DARNELL, C. M. A Clinic on Acute, Old-Fashioned Gout, with Special Reference to Its Inciting Factors. Med. Clin. North America, XVI, 1371, 1933.
- 9 ALLBUTT, SIR T. C. Gout. In Oxford Medicine, IV, p. 80. New York, Oxford University Press, 1932.

GIANT-CELL TUMOR OF THE SACRUM

BY MARK H. ROGERS, M.D., BOSTON, MASSACHUSETTS

From the Orthopaedic Clinic of the Beth Israel Hospital

The reason for reporting this case is to put on record a proved case of giant-cell tumor in an unusual location.

A married woman of twenty-nine entered the wards in November 1934 on account of intense pain of six months' duration, extending from the right sacro-iliac region down the leg, chiefly of sciatic distribution.

The physical examination showed acute tenderness in the region of the right sacro-iliac joint, with restriction of motion corresponding to a sensitive joint. The rectal examination showed a tender mass over the anterior surface of the sacrum.

The blood chemistry indicated that the phosphorus and calcium were within normal limits.

The roentgenogram (Fig. 1) showed a loss of substance involving the sacrum and right sacro-iliac joint.

At operation, in which the Smith-Petersen incision was used to approach the sacro-iliac joint, a piece of the ilium about two inches square, was removed. The bone was a very thin shell over the lower portion, a grayish, soft tumor mass protruded from the sacrum, and on immediate frozen section this was reported to be a giant-cell tumor. With curette and sponges the tumor mass was cleaned out as thoroughly as possible, but, on account of the depth of the tumor cavity in the sacrum, it was doubtful whether or

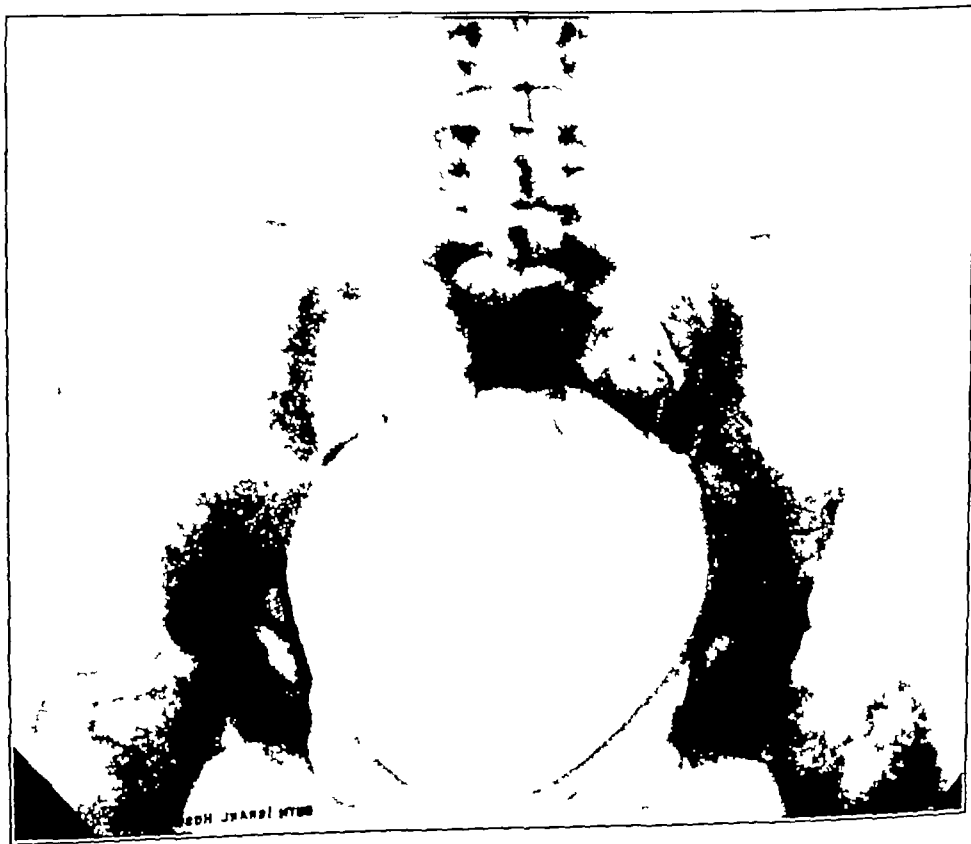


FIG. 1



FIG 2

not all tumor tissue had been removed. The cavity was packed with five vaselined sponges which were allowed to come out gradually in two weeks' time.

The immediate effect of the operation was extreme relief of pain, showing that the pain had been due to the expansion of the tumor against the bone.

A roentgenogram taken five months later (Fig 2) shows that there has been a definite attempt at new bone formation and a filling in of the bone cavity. There is a small granulating sinus which has not shown tumor tissue. Clinically, the patient is free from pain, and there is no evidence of instability of the sacro-iliac joint in spite of removal of so large a portion of the ilium.

The report on the pathological sections is as follows: "Microscopic examination reveals a very cellular fibrous stroma. Scattered through this stroma are a tremendous number of giant cells. Diagnosis: benign giant-cell tumor."

REFRACTURE OF A REGENERATED INTERNAL SEMILUNAR CARTILAGE

BY RAPHAEL R. GOLDENBERG, M.D., PATERSON, NEW JERSEY

From the Hospital for Joint Diseases, New York, N. Y.

Although cases of regeneration of the internal semilunar cartilage have been observed and recorded by various writers, Moller¹, in 1930, was the first to report a case of refracture of a regenerated internal semilunar cartilage. Because of the apparent rarity of this condition, the author believes that the following case is worthy of recording.

A woman, aged twenty-eight, was admitted to the Hospital for Joint Diseases on June 16, 1930, as a patient of Dr. I. Balensweig. Eighteen months previously, while playing basketball, she had been struck on the outer aspect of the right knee which then became locked. The knee had been strapped in extension and the patient had received diathermy. Subsequently, following slight traumata, the knee had locked, and on each occasion there had been pain and swelling of the joint. In the five months prior to admission, the knee had locked on an average of once weekly.

At examination, the patient walked without a limp. There was moderate swelling of the right knee, patellar ballottement was elicited. There was tenderness over the internal meniscus. The angle of greatest extension was 170 degrees, the angle of greatest flexion, 45 degrees.

At operation, June 18, 1930, an incision was made on the inner aspect of the right knee, exposing the internal semilunar cartilage. The posterior half of the cartilage was found to be split and was completely excised. Loose fibrous tissue was found to come from the region of the intercondylar notch and appeared to arise from the external semilunar cartilage. Because of this, an incision was made on the outer aspect of the knee. The posterior one-half inch of the external cartilage was found to be detached, and was removed. Both wounds were closed.

The patient was perfectly well until October 1932, when she sustained an injury to her right knee. Immediately there was a recurrence of the original symptoms of locking, pain, and swelling. Again she observed that slight traumata caused the joint to lock. She was admitted to the Hospital for Joint Diseases on October 28, 1934, on the Service of Dr. Leo Mayer, to whom the author is indebted for permission to report this case. An x-ray taken prior to admission was negative.

At examination, the patient walked without a limp. There were two longitudinal scars, three inches in length, on the medial and lateral aspects of the knee. Moderate swelling of the joint was noted, and slight patellar ballottement was elicited. There was

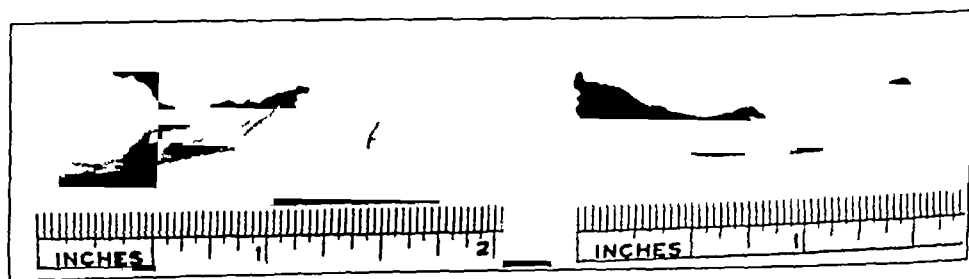


FIG 1

Portion of internal semilunar cartilage removed at operation

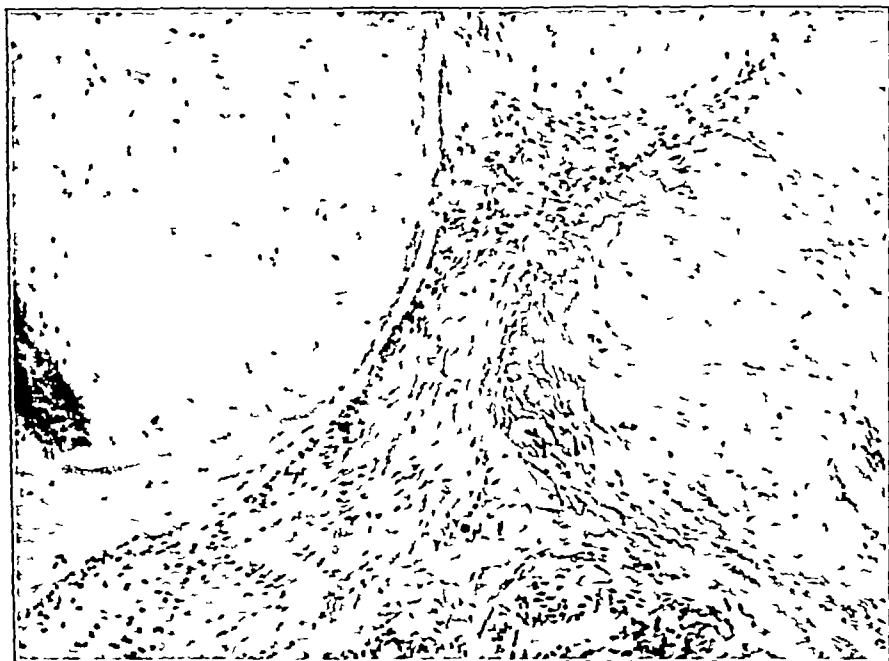


FIG 2

Photomicrograph ($\times 110$) showing cellular fibrocartilage with normal staining nuclei

marked tenderness over the internal meniscus. The angle of greatest extension was 180 degrees, the angle of greatest flexion, 40 degrees.

At operation, October 29, 1934, an incision was made parallel to the internal femoral condyle. The internal meniscus was found to be completely torn away from the capsule for one inch. The piece of cartilage removed measured approximately one and three-quarters inches along the external border.

The pathological report by Dr. Sheldon A. Jacobson was as follows:

"Specimen No. 12878. Cartilage from right knee.

'*Gross*' Specimen consists of a semilunar cartilage. Its edge is attached, thick and rounded." (See Figure 1.)

"*Microscopic* Section shows several areas of more or less cellular fibrocartilage with normal staining nuclei. These are connected by bands of fibrous tissue." (See Figure 2.)

The external semilunar cartilage was not inspected. The wound was closed.

- 1 MÖLLER, WERNER. Luxation eines nach Exstirpation neugebildeten Kniegelenks-meniscus. Zentralbl. f. Chir., LVII, 2790, 1930.

AVULSION OF THE EPIPHYSIS OF THE OS CALCIS

BY VOIGT MOONEY, M D , PITTSBURGH, PENNSYLVANIA

Avulsion fractures of the os calcis result in a separation of a shell of the posterior portion, or a chip, from the body of the os calcis, due to the pull of the tendo achillis. The line of separation of this shell of bone may pass through the epiphyseal plane which lies near the posterior margin of the os calcis. Cases of avulsion of the epiphysis of the os calcis are not common. However, the condition has been reported in the literature. The treatment of these avulsions is operative.

The case reported below illustrates an unusual type of fracture of the os calcis.

S. K., a white, fat girl, aged thirteen, was examined at the Allegheny General Hospital, October 17, 1934. She stated that, while playing with some other children, she twisted her right ankle. Sudden severe pain resulted and the girl fell to the ground. She was brought to the hospital immediately.

Examination showed much swelling and discoloration over the medial aspect of the right ankle. Palpation caused discomfort and the posterior portion of the os calcis appeared empty. Roentgenograms taken by Dr. Ray showed an avulsion of the epiphyseal portion of the right os calcis.

A curved incision, two inches long, was made over the lower portion of the tendo



FIG 1

Roentgenogram, October 17, 1934, showing avulsion of the epiphysis of the os calcis.



FIG 2

Roentgenogram taken after operation, showing epiphysis reduced.



FIG 3

Roentgenogram, March 25, 1935, showing good result

achillis It was noted that the shell of bone attached to the tendo achillis was riding free The tendo achillis was lengthened as much as necessary The shell of bone was then pulled down and made to contact the old bed where it was held fast by interrupted chromic marginal sutures After the wound had been closed and dressed, a plaster-of-Paris spica, which extended over the flexed knee, was applied with the foot held in plantar flexion

Weight-bearing was allowed after ten or twelve weeks

The result in this case was good

CONGENITAL ABSENCE OF TRAPEZIUS AND RHOMBOIDEUS MAJOR MUSCLES*

BY BRYANT R SELDEN, M D , BETHLEHEM, PENNSYLVANIA

Congenital absence of muscles about the shoulder is comparatively rare. According to Almstead¹, there were on record in 1933 about 237 cases of pectoral defects. Sheehan² and Schulze-Gocht³ have reported recently the still more rare condition of the absence of the trapezius. Since no instance of congenital absence of both the trapezius and rhomboideus major muscles has been found in the last fifteen volumes of *Index Medicus*, the following case is reported.

The patient, a young man, twenty years of age, of German extraction, a farm-hand, presented a condition involving the congenital absence of several pairs of muscles of the thorax. His physical activities consisted of occasional games of baseball or football, but he did not play in regular games. He could not climb a rope. He pitched hay, shocked grain, cultivated corn, and did other similar farm work.

When first seen at the clinic, the most outstanding feature about the patient's physical appearance was the presence on each side of a mass of muscle and bone about midway

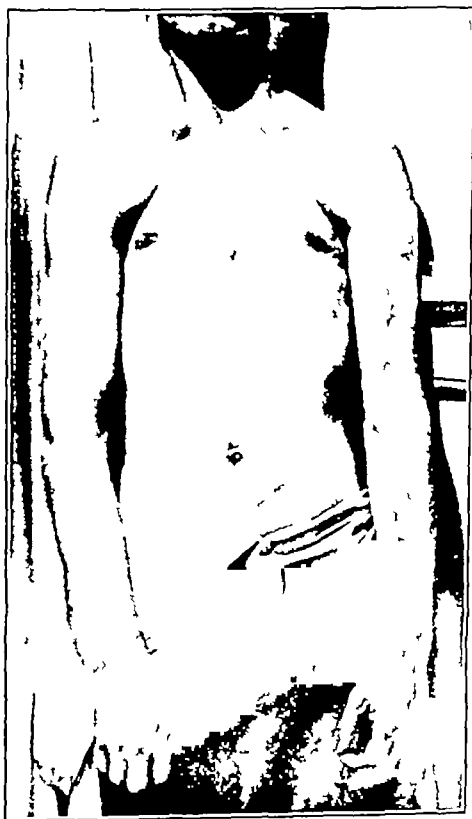


FIG 1-A

Appearance of patient when first seen, showing the absence of the trapezius and rhomboideus major muscles



FIG 1-B

* From the Surgical Service of Dr. W. L. Estes, Jr., St. Luke's Hospital, Bethlehem

TABLE I
CONDITION OF OTHER MUSCLES OF THE SHOULDER

Muscle	Present	Condition	Remarks
Deltoid	Bilaterally	Well developed	The usual acromial and clavicular points of origin were present, but only the outer half inch of the spine of the scapula was represented in the origin
Rhomboideus minor	Bilaterally	Well developed	
Teres major	Bilaterally	Poorly developed	
Latissimus dorsi	Bilaterally	Moderately well developed	
Supraspinatus	Bilaterally	Fairly well developed	
Infraspinatus	Bilaterally	Quite well developed	
Splenius capitis	Bilaterally	Exceptionally well developed	
Splenius cervicis	Bilaterally	Exceptionally well developed	
Coracobrachialis	Bilaterally	Exceptionally over developed	These muscles seemed to be doing the work of the missing pectoral muscles

between the normal locations of the acromial process and the base of the neck. On careful examination, this mass was found to be the inner angle of the scapula and the greatly hypertrophied levator scapulae muscle. This marked prominence has been considerably corrected by the application of a brace. The patient's manoeuvres in elevating and abducting the extended upper extremities were of special interest. He could get them nearly horizontal with a fair degree of ease, but, in order to continue the motion and get the extended arms above his head, he was obliged to place himself in a position of exaggerated lordosis. After getting his arms into the vertical position, he then resumed his natural posture.

Further examination of the patient revealed the complete absence of both trapezius muscles, the complete absence of both rhomboideus major muscles and the absence of the greater portion of both pectoralis major muscles. The only part of the right pectoralis major muscle which was present arose from the outer one and one-fourth inches of the inner half of the clavicle. The left side was represented by a narrower band, originating on the outer three-fourths of an inch of the inner half of the clavicle. This is the only instance where the muscles were not bilaterally symmetrical. Table I shows the condition of the other muscles of the shoulder.

The absence of the particular combination of muscles described,—namely, bilateral absence of the trapezius and rhomboideus major and the partial absence of the pectoralis major muscles—has apparently never been previously reported.

REFERENCES

1. ALMSTEAD, STANLEY. Congenital Defect of the Pectoral Muscles. *Lancet*, I, 1170, 1933.
2. SHEEHAN, DONAL. Bilateral Absence of Trapezius. *J. Anat.*, LXVII 189 1932.
3. SCHULZE-GOCHT. Über den Trapeziusdefekt. Zugleich ein Beitrag zur Frage der Skoliosenentstehung. *Arch. f. Orthop. u. Unfall-Chir.*, XXVI, 302, 1928.

A SIMPLIFIED INSTRUMENT FOR USE IN THE TREATMENT OF FRACTURES OF THE LEG BY THE TWO-PIN METHOD

BY ROY R SCHUBERT, M D , PATERSON, NEW JERSEY

A simplified instrument for use in the reduction of fractures of the leg by the two-pin method has been devised by the author. It consists of a pair of round, cold-rolled, steel rods, twenty-six inches in length and three-eighths of an inch in diameter. One end of each rod is threaded with an S A E thread, in the conventional right-hand turn, for a distance of ten inches. The other end of each rod is similarly threaded, except that a left-hand thread is employed (Fig 1, A)

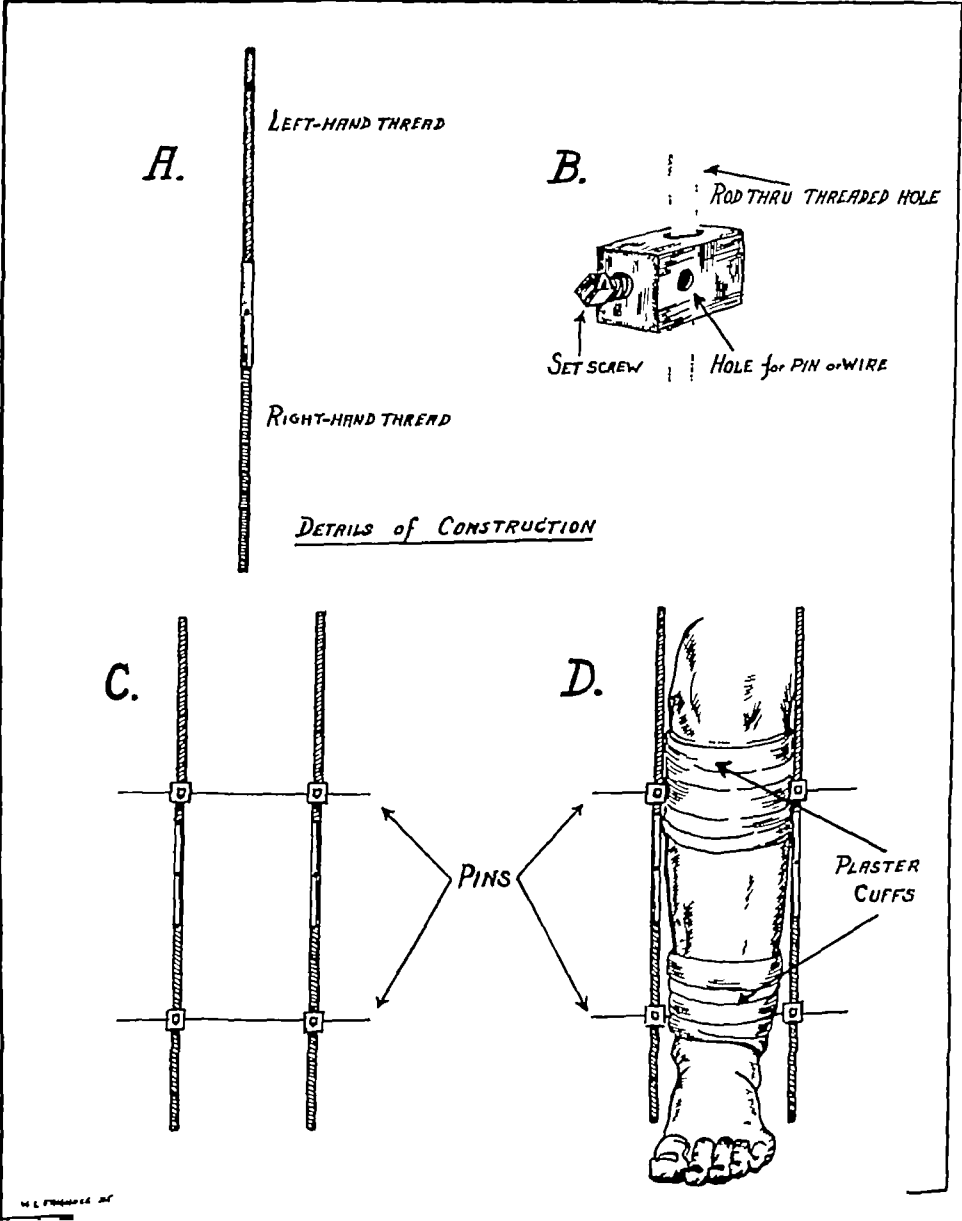


FIG 1

Four offsets, three-fourths of an inch by three-fourths of an inch by one inch, are then prepared from square cold-rolled stock. Two of these offsets are drilled and tapped to accommodate the right-hand thread, the other two, to accommodate the left-hand thread. At right angles to the threaded hole, and as close to it as is practical, another hole, three-sixteenths of an inch in diameter, is drilled. This will later serve to hold the Steinmann pin or transfixion wire. The end surface of the offset nearest the unthreaded hole is then drilled and tapped so that a set-screw will hold the pin or wire in place (Fig 1, *B*). When the instrument is assembled, turning the long rod in one direction will cause the offsets to move apart or together, depending on the direction of turn.

After insertion of the pins or wires by the usual technique, a narrow plaster cuff (two to four inches wide) is applied around each pin, and allowed to set. When the Steinmann pin is used, it is necessary merely to apply a rod to each side of the leg by inserting the pins in the unthreaded holes, tightening the set-screws, and making traction as described below (See Figure 1, *D*). With the transfixion wire, however, it will be necessary to use the usual wire spreaders for a period of twenty-four to thirty-six hours until the plaster dries thoroughly, at which time the offsets, which were pushed against the plaster and tightened, will hold the wire rigid. Traction may then be applied by turning the long rods in the proper direction with pliers or a key fitted into a slot in the unthreaded portion of the long rod.

Lateral bowing may be corrected by turning one rod more than the other. After application of the rods, the fragments are rotated manually to their proper positions and are held in place by plaster. When the desired reduction has been accomplished, preferably under the fluoroscope the limb and instrument may be incorporated in the usual plaster cast. After a few days, a walking iron may be applied and active use of the limb permitted.

Among the advantages of this instrument are

- 1 It is simple of construction and application
- 2 It is easily portable
- 3 It affords adequate traction and counter-traction
- 4 It may be incorporated as part of the walking cast, with little increase in weight or bulk

CONGENITAL ABSENCE OF THE SACRUM

BY P M GIRARD, M D , DALLAS, TEXAS

From the Texas Scottish Rite Hospital for Crippled Children

In reviewing the literature, the author has found recorded twenty-seven cases of congenital absence of the sacrum. Hamsa¹ has recently described two cases and included a synopsis of the eighteen cases which he found in the literature. In addition to these twenty cases, the author has found in the literature seven others^{2, 3, 4, 5, 6, 7, 8} the first of which was reported by Hohl² in 1852. Since this condition is rare, the following report of a case of complete absence of the sacrum and coccyx may be of interest.



FIG 1

Roentgenogram showing partial fusion of the fourth and fifth lumbar vertebrae and complete absence of the sacrum and coccyx.

D D, a white female, aged six years, was born at full term. She was a "blue baby" and had "smothering spells" immediately after birth. The following deformities were noted at birth (1) club feet, (2) malformation of the vagina and rectum in which a sort of cloaca was present, the vagina and rectum being separated only by a thin membrane. The family history was negative for congenital deformities. The three other children were normal.

The patient was small for her age and hard of hearing. Otherwise, the head, neck, upper extremities, and thorax were normal. Over the fifth lumbar area was a large, flabby, flat, fatty tumor about eight centimeters in diameter. The hips were narrow and the distance from the level of the fifth lumbar vertebra to the trochanters appeared excessively long. The hip joints did not subluxate. The deformity of the vagina and rectum was quite striking. There was incontinence of urine and faeces. No trophic signs were demonstrable. The patient had some muscle control over the lower extremities. There was sensation over the legs and feet, although the neurological examination was inaccurate on account of the patient's age and lack of cooperation. The child was able to walk poorly with the aid of crutches. The poor gait was due to muscle weakness in the lower extremities.

Roentgenographic examination (Figs 1 and 2) revealed partial fusion of the fourth and fifth lumbar vertebrae and complete absence of the sacrum and coccyx.

At present, the patient has been given braces to improve her gait. Later, when she is about eight years old, stabilization operations upon the feet will probably be done, in order to eliminate the need of the braces.

The characteristic features of this case, as in most other similar cases, are incontinence of urine and faeces, muscle weakness in the lower extremities, and club feet, both of which conditions are



Fig 2

Lateral roentgenogram showing partial fusion of the fourth and fifth lumbar vertebrae and complete absence of the sacrum and coccyx.

related to the changes in the lower cord segments, narrowing of the hips and congenital malformation in the vagina and rectum, and other conditions as shown in Figures 1 and 2

REFERENCES

- 1 HAMSA, W. R. Congenital Absence of the Sacrum. *Arch Surg*, XXX, 657, 1935
- 2 HOHL, A. F. *Zur Pathologie des Beckens. I. Das schrag-ovale Becken*, p. 61. Leipzig, Wilhelm Engelmann, 1852
- 3 SUTTON, J. B. *An Introduction to General Pathology, Founded on Three Lectures, Delivered at the Royal College of Surgeons, London, 1886*. Philadelphia, P. Blakiston, Son & Co., 1886
- 4 DESCHAMPS. *Ann d'Orthop et de Chir Pratique*, VII, 367, 1894
- 5 FROELICH. Absence congénitale d'une moitié de sacrum. *Soc de Méd de Nancy*, C-r 59, 1904-1905. Also in *Rev Méd de l'Est*, XXXVII, 308, 1905
- 6 HIGGS, S. L. Specimen of Congenital Absence of the Sacrum. *Proc Roy Soc Med*, XVII, Part III, Sect Orthop, 39, 1924
- 7 ESPASA, M. S. Un caso de agenesia del sacro. *Rev Méd de Barcelona*, 1928
- 8 NEWELL, J. L. A Case of Multiple Congenital Anomalies of the Mullerian and Genito-Urinary Systems with Absence of the Coccyx. *New England J Med*, CCX, 1217, 1934

AN INSTRUMENT FACILITATING USE OF THE FLANGED NAIL IN TREATMENT OF FRACTURES OF THE HIP

By J. WARREN WHITE, M.D., GREENVILLE, SOUTH CAROLINA

In view of the increasing popularity of the use of fixation in intra-capsular fractures of the neck of the femur, the report of a method and the description of an instrument that facilitates the use of the flanged nail seem warranted.

After satisfactory reduction of a fractured hip, as proved by the Leadbetter test and confirmed by satisfactory anteroposterior and lateral x-rays, the lateral aspect of the subtrochanteric region of the femoral shaft is generously exposed. The injured limb is held internally rotated and moderately abducted to a degree expected to maintain the normal relations of the fragments at the site of fracture. The nail is then introduced through the lateral cortex of the femoral shaft about an inch below the lower margin of the trochanter and in a plane parallel to the surface of

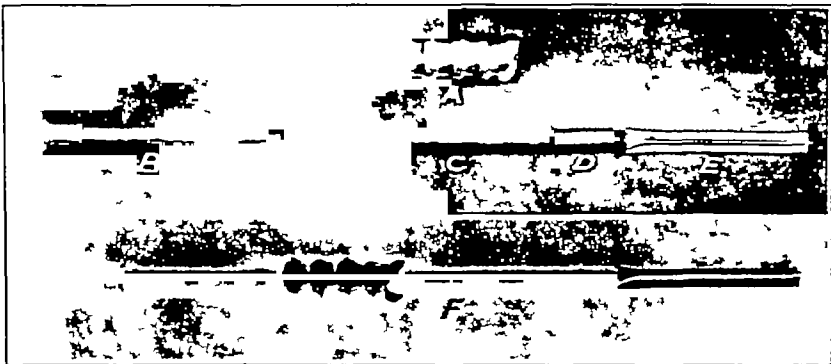


FIG 1

Instrument facilitating the use of the flanged nail

A Combined impactor and extracting hammer, shaped to fit the femoral shaft obliquely just below the trochanter

B End section

C Middle section

D Small section

E Flanged nail.

F Apparatus assembled

the supporting surface. This nail is directed mesially and proximally toward a point midway between the spine of the pubis and the anterior-superior spine, and is then driven home, the impactor (A in the illustration) is used to closely approximate the fragments.

The instrument, as shown in Figure 1, is merely a removable extension of the nail, which can be detached when it has been demonstrated that the nail is properly placed. For convenience the instrument is

divided into three sections the end piece, away from the nail, is surmounted by a knob and the middle piece, about the same length of the end piece, screws into a section, one inch in length, which, in turn, fits into a threaded hole in the head of the nail

The advantages of the instrument are threefold first, it enables one to control the direction of the pin better during actual driving, second, the heavy collar which fits loosely to the shaft can be used as an impactor when it is placed over the nail with the short one-inch sector still attached, third, if for some reason the immediate or early extraction of the nail is desired, the impactor can be fitted on to the shaft at one of the joints, and with it the entire apparatus can be gently hammered out and the nail can be withdrawn It will be noticed that the collar is shaped at one end so as to fit the normal obliquity of the femoral shaft at the base of the trochanter

SAM BROWNE PLASTER-OF-PARIS BELT FOR IMMOBILIZATION OF THE CHEST *

BY RICHEY L. WAUGH, M.D., NEW ORLEANS, LOUISIANA

Surgeon United States Public Health Service

There is a growing conviction that the old-time method of strapping three-fourths of the chest with adhesive plaster in cases of fracture of the ribs or in pleurisy is not only uncomfortable for the patient, but is unsatisfactory from the standpoint of treatment, in that it does not adequately immobilize the chest. It is objectionable to patients with hairy chests and it irritates the skin of many others.

For fractures of the lower ribs, the strapping of the whole circumference of the chest with adhesive plaster has frequently been recommended, and, for fractures of the upper ribs, the same treatment has been prescribed, with the addition of a strip of adhesive plaster over the shoulder. Funston¹, in 1931, described a binder fashioned of canvas with a shoulder strap, similar to a "Sam Browne" belt. For the individual with an excessive growth of hair, Hammond² recently advocated a belt made of six-inch webbing, reinforced with corset steels to preserve the shape of the belt.

The Funston belt, which was used in this Hospital during 1931 and 1932, proved efficient and comfortable. However, it was found necessary to wash the belt after individual use, and the frequent washing was not only bothersome, but caused the belt to become wrinkled and unserviceable.

A "Sam Browne" belt, made of plaster-of-Paris, was then devised and has been used ever since. This plaster-of-Paris fixation dressing is applied directly to the chest of the patient during expiration. The plaster dressing should not be too thick. Six or seven layers of plaster bandage make the dressing about the thickness of a starched linen collar. This thickness is sufficient to preserve the

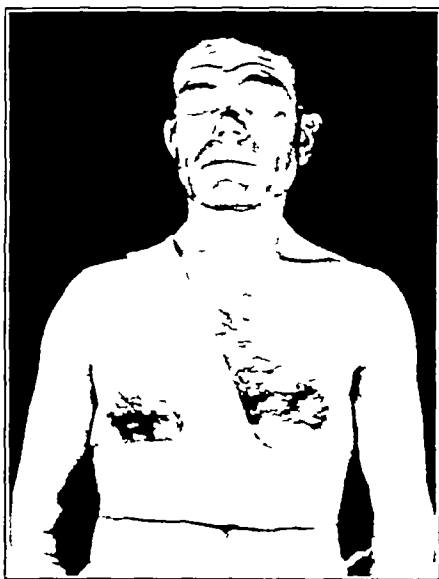


FIG 1
Showing "Sam Browne" plaster-of-Paris
belt applied in a case of fracture of ribs

*From the Surgical Service, United States Marine Hospital, San Francisco, California.

shape of the belt and to immobilize the chest adequately, it is not rigid enough to be uncomfortable when the patient is lying in bed

REFERENCES

- 1 FUNSTON, R V "Sam Browne" Belt for Rib Fractures J Bone and Joint Surg , XIII, 174, Jan 1931
- 2 HAMMOND, ROLAND A Method of Strapping the Chest for Fracture of the Ribs J Bone and Joint Surg , XVII, 233, Jan 1935

TREATMENT OF DEPRESSED FRACTURES OF THE ZYGOMATIC (MALAR) BONE AND THE ZYGOMATIC ARCH

BY ROBERT F. PATTERSON, M.D., KNOXVILLE, TENNESSEE

Depressed fractures of the zygomatic arch often present difficult problems if reduced successfully without scar formation. Fleeshy individuals are especially hard to treat successfully, owing to the depth of the bone and the difficulty of grasping it with an instrument such as the towel clip used by some¹, because there is so much soft tissue in the bite that it will not reach the bone. One must grope blindly, and usually unsuccessfully, when using instruments ordinarily suggested. If treated by open operation, an unsightly scar results, which is henceforth a source of mortification to the patient.

The difficulty of treating these cases is enhanced by the fact that great force is often necessary to pull the bone outward. Since the pull is against the apex of a triangle, much of the force is dissipated by being transmitted along the longitudinal axis of the fragments instead of transversely, as desired, to effect the reduction.

The four case reports which follow illustrate the problems involved and a successful means of reduction.

CASE 1 A. B. L., a male, aged thirty, while acting as referee in a wrestling match on December 5, 1934, was struck over the left zygomatic arch with the naked fist of an angry wrestler. The point of the blow landed squarely in the middle of the right arch, driving



FIG. 1

Case 1. Fracture of right zygoma before reduction.



FIG 2

Case 1 After reduction

it inward almost to the skull and producing a greenstick fracture with the fragments lying at an angle of about 30 degrees. A marked depression in the face resulted. The patient experienced difficulty in moving the mandible, especially forward.

It was evident that the soft tissues were being pressed against the coronoid process of the mandible. Being a man of fine appearance, the patient naturally recoiled from an open operation. The fact that his face was full added to the difficulty of closed reduction.

The bone was restored to normal position in the following manner. A Straude-Moore straight tenaculum, five and three-quarters inches in length, with a Collins slip lock, was used. This instrument has a large curve or grasping space. The halves were disengaged, and one point was inserted straight through the skin and soft tissues just above where the zygomatic arch normally lies. In selecting the point of introduction, allowance was made for the great depth to be traversed to reach the bone. The tenaculum was pushed inward and downward in the line of its curve until it struck the zygomatic process. It was engaged behind the bone and the handle elevated. The other half of the instrument was then introduced in a similar manner below the bone, the point passing inward and upward until it also caught behind the bone. With considerable difficulty, the handles were eventually brought into position and locked. This provided a powerful grip on the process at the site of the fracture. The instrument could not slip, being held in place by the soft tissues.

After the author had guardedly exerted his entire strength, a snap occurred and the bone sprang back into normal position. The depression disappeared from the face. Immediately upon awaking, the patient expressed complete relief from the binding sensation in moving the mandible.

CASE 2 S H, a male, aged twenty, was struck on the left malar bone while playing football in the fall of 1933. The blow depressed the entire bone, including the outer floor and rim of the orbit. It carried inward also the anterior portion of the zygomatic process of the frontal bone.

In this case, one tooth of the Straude-Moore tenaculum was caught over the anterior border of the orbit while the other tooth pierced the muscles of the face beneath the

malar bone Strong outward traction was made An ice pick was thrust beneath the outer end of the malar bone to assist in the elevation By this means, the structures were raised to such an extent that the deformity was largely overcome

CASE 3 * M F C, a male, was admitted to the Knoxville General Hospital on May 1, 1935 On the day of admission, the patient had been struck on the left side of his face with a fist, producing a marked depressed appearance of the left cheek bone

An x-ray examination showed a fracture of the left zygoma with the zygomatic arch greatly depressed

On May 2, 1935, under anaesthesia one-half of a Straude-Moore tenaculum was passed around the superior margin of the depressed zygomatic arch, the other half passed around the inferior margin, and the two halves fastened together By an outward pull on the instrument, the zygomatic arch was raised to its normal position, restoring the contour of the face

* From the Orthopaedic Service of Dr Jarrell Penn

CASE 4 R L N, a male, aged twenty-one, struck his right cheek against the side of a pool while diving on June 22, 1935 A depressed fracture of the right malar bone resulted It was severed from the zygomatic arch at its junction with the arch The latter was not depressed

Under ether anaesthesia, a Straude-Moore tenaculum was introduced around the outer end of the zygomatic process of the malar bone Traction was fruitless and only straightened out the hooks of the tenaculum The veterinarian tenaculum was then inserted from below (beneath the malar bone) at its junction with the process By using great force and by rocking the instrument to break up impaction, the author was finally able to elevate the bone to practically normal position The two sides of the face now appear symmetrical

If reduction cannot be secured with the Straude-Moore instrument in zygomatic fractures, the powerful veterinarian tenaculum is forced in above the arch and hooked around the bone Leverage against the skull can be exerted if necessary In malar fractures this instrument is introduced from beneath, as described in Case 4 The ordinary ice pick is also often useful in reduction

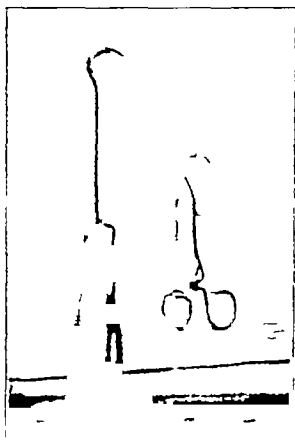


FIG 3

At left, veterinarian tenaculum, at right, Straude-Moore tenaculum

- 1 KEY, JOHN ALBERT, AND CONWELL, H EARLE The Management of Fractures, Dislocations, and Sprains St Louis, The C V Mosby Company, 1934

GRADUATE INSTRUCTION IN ORTHOPAEDIC SURGERY

REPORT OF COMMITTEE APPOINTED BY THE AMERICAN ORTHOPAEDIC ASSOCIATION *

In 1933, a committee of five was appointed by the American Orthopaedic Association to investigate graduate teaching in the United States. The report of this Committee has now been prepared.

A questionnaire was sent out to all the medical schools, the Shriners' Hospitals, and three other hospitals, a total of sixty-four schools and fourteen hospitals, which read as follows:

- 1 Does your medical school or hospital give any graduate courses in Orthopaedic Surgery?
- 2 If so, what is the length of the course?
- 3 What is the preliminary training required?
- 4 Are diplomas or degrees awarded?
- 5 Is there a hospital connected with the school, which has an Orthopaedic Department? If so, what is the length of service of the house officers and residents?

Answers to this questionnaire were received from sixty-two medical schools, eleven Shriners' Hospitals, and three other hospitals.

Thirteen medical schools have no Orthopaedic Departments. Of these thirteen schools, six have direct hospital connections. The length of time devoted by house officers to orthopaedic work in these institutions varies from twenty-eight days to two months and, in some cases, the work is in combination with other departments. In three instances, the Surgical Resident cares for the orthopaedic cases.

There are fifteen medical schools with hospitals which have Orthopaedic Departments. The time spent in Orthopaedic Surgery varies from three weeks to four months for each interne. The average is about one to two months. At Syracuse, a Resident in Pediatrics has charge of Orthopaedic Surgery.

Nine medical schools give graduate courses in Orthopaedic Surgery, varying from two weeks to two years. The short courses are given for practitioners and the long courses for internes. The nine medical schools in this group have hospital connections. There are twenty-five schools that give no graduate courses in Orthopaedic Surgery. Out of this group, there are eleven with hospital connections.

Five of the nine medical schools giving orthopaedic courses offer internships in Orthopaedic Surgery at their hospitals. In the group of eleven schools with hospital connections, but not offering courses in Orthopaedic Surgery, the internships in Orthopaedic Surgery range from three to six months. One school in this group had a residency in Orthopaedic Surgery lasting from one to two years.

The Shriners' Hospitals number eleven. Out of the eleven, four have no resident surgeons. Courses vary from one to two years, or more. At the Shriners' Hospital in St. Louis, the Assistant Residents from the Surgical Department in Washington University rotate through the hospital as part of their surgical service at Barnes. Six of the eleven hospitals have internes who are serving and have served in the surgical hospitals in the neighborhood. The time varies from seven weeks to four months.

The New York Society for the Relief of the Ruptured and Crippled now has a service of two years for internes, and for resident surgeons a course lasting one year.

At the New York Orthopaedic Hospital and Dispensary, there are eight internships of two years, six months being spent at the convalescing branch at White Plains. The internes serving at the New York Orthopaedic Hospital and Dispensary, at the New York Society for the Relief of the Ruptured and Crippled, and at Harvard Medical School must be graduates of accredited medical schools and must have served a rotating intern-

* Presented at the Annual Meeting of the American Orthopaedic Association at Philadelphia, Pennsylvania, June 6, 1935, by Frank R. Ober, M.D., Chairman.

TABLE I
MEDICAL SCHOOLS WHICH GIVE GRADUATE COURSES IN ORTHOPAEDIC SURGERY

Medical School	Length of Each Course	Diploma	Hospital Connection with Orthopaedic Department	Number Months Required	Preliminary Training Required
Columbia	2 one-week courses offered in each half year	No	Yes		Degree from accredited medical school and State license
Harvard	2 years 2 month course, monthly clinical course	No	Yes	21 months 8 in pathology, 8 at Children's Hospital, and 8 at Massachusetts General Hospital	Degree from accredited medical school, 1 year of surgical or 2 of rotating internship
Illinois	Optional 1 to 2 months or 1 to 2 years	No	Yes		Degree from recognized medical school
Iowa	1 year (over 1,400 hours)	No	Yes		Degree from Class A medical school
Johns Hopkins	Minimum 24 weeks' intensive work		Yes	3 internships of 12 months each, 2 assistant residencies of 12 months each, 1 residency of 1 year	Approval of Prof of Surgery and Assoc Prof of Orthopaedic Surgery, 1 year of general surgery either before entering or after 1 year
Minnesota		Yes { M S Ph D	Yes	1 term as house officer in each of 2 Rochester hospitals and 5 3-year services	Degree from Class A medical school and 1 year of internship in good hospital
New York Polyclinic	3 months' clinical course, 5 periods of operative orthopaedics on cadaver	No	Yes		Degree from Class A medical school and 1 year of internship on 5 years of active practice
Pennsylvania	Minimum 8 months, for degree, 1 or more years Also 8 weeks' study of orthopaedic diagnosis	Yes M S or Ph D if graduate of a Class A medical school	Yes	Graduate students on basis of visiting assistantships	Degree from Class A medical school, 1 year of internship or equivalent, member A M A or equivalent, good personality, no defects
Yale	18 months 2 courses in orthopaedic surgery, 1 course in fractures	No Course 4 run to ward Ph D	Yes	Internship, 2 months, Assistant Residents, 1 month, Residents, 1 year	M D degree

MEDICAL SCHOOLS OFFERING NO GRADUATE COURSES IN ORTHOPAEDIC SURGERY

Medical School	Graduate Courses of Any Sort	Affiliated Hospitals with Orthopaedic Departments	Comments
Albany	Review courses in General Medicine, lectures and clinics in hospital in district, with which school is affiliated, and a residence course of six weeks		The courses in the specialties should be part of the course in Medicine or a system of training such as given at The Mayo Clinic, or a plan for internships, assistant residencies, and residencies. Danger of men taking one, two, or four months' work and considering themselves specialists
Buffalo	"No graduate course in Orthopaedic Surgery as such." See Comments	Buffalo General Children's City	Department of Orthopaedic Surgery contributes six hours in a two-weeks' graduate course in General Medicine and Surgery. Also contributes six or eight clinics for graduate physicians and house officers in various teaching hospitals, which clinics are run continuously through teaching year. This orthopaedic work considers fractures and disabilities associated with traumatic surgery of this type, also acute and chronic bone infections
California	For several years short courses offered during June. Canceled in 1933, due to small enrollment. At time of discontinuance, Orthopaedic Surgery to be included in General Surgery		
Cincinnati	No graduate courses "properly speaking." See Comments	Cincinnati General	Graduate student in the School of Surgery is assigned to Orthopaedic Department as house officer for six months and then replaced by another. Also a graduate given rank of Instructor serves as Resident in Orthopaedic Surgery for one year with possibility of reappointment. Requirement for this latter appointment is a general internship, followed by not less than one year of special training in general surgery (two years preferred). No diplomas
College of Medical Evangelists	No graduate courses		
Colorado			Do not anticipate giving graduate courses in Orthopaedic Surgery in near future

Cornell	No graduate courses		Matter of offering graduate courses for graduates of Class A schools "has been discussed." To follow a definite schedule of work for sufficiently long time to acquire definite information and skill in dealing with subject (say two years). Probably will grant "something in way of a diploma."
Detroit			
George Washington			
Georgia	No graduate courses	University	Orthopaedic Surgery is taught as a subdepartment of Surgery and conducted as such in the Hospital
Indiana	Offers a two-week post-graduate course (eight hours devoted exclusively to Orthopaedic Surgery)	Riley, for children (100 beds entirely for orthopaedic cases), Robert W. Long, Indianapolis City (has large Out-Patient Fracture Service)	Two Orthopaedic Residents chosen from internes showing aptitude and interest. The appointments are for two years. Diplomas given to Residents after completion of the two years' work
Kansas			No courses, no affiliated hospital offers graduate work in Orthopaedic Surgery "Sorry, I think there is considerable need of work of this kind."
Long Island			
Michigan	Certificate of Attendance given for three months or more of post-graduate work. Certificate of Proficiency in particular branch of medicine if one year or more with good record (Actually minimum has been two years)	University (has large, well-staffed orthopaedic department)	Believes that "in near future" graduate courses in Orthopaedic Surgery will be offered. Graduate work in Orthopaedic Surgery not infrequently done under supervision of one of several instructors in department and by attending the various undergraduate lectures and clinics
New York			
Homoeopathic			
Northwestern			Offers two or three residencies in Orthopaedic Surgery which in themselves constitute graduate training
Ohio State			
Rush		An orthopaedic hospital connected with University of Chicago (University of Chicago Clinics), Presbyterian	Efforts of School in Orthopaedic Surgery are confined to instruction of undergraduate students

TABLE II (Continued)

Medical School	Graduate Courses of Any Sort	Affiliated Hospitals with Orthopaedic Departments	Comments
Stanford			Four internes at Lane Hospital who serve a year as surgical internes devote three months each to Orthopaedic Surgery. At end of year receive M D degree. Graduates permitted to attend daily morning orthopaedic clinic. (Not enough orthopaedic cases to warrant separate service for assistant resident or house officer.) No diplomas.
Texas		John Sealy	
Tulane	See Comments		Only Orthopaedic Surgery taught in Graduate School is what occurs in general review course in Surgery and its allied branches.
University and Bellevue	Offers graduate course in Surgery of two and one-half years. (Does not include special work in Orthopaedic Surgery.)	Bellevue	
Vanderbilt			
Washington University	Only graduate courses given in Obstetrics, Gynecology, and Pediatrics. No diplomas.		
Western Reserve		Lakeside has one residency in Orthopaedic Surgery, usually a year's appointment, two or three years' training in General Surgery prerequisite.	No organized courses in the medical specialties. Each department free to accept for training such individuals as it considers desirable and to give such training as the individual case requires.
Wisconsin		125-bed orthopaedic hospital for children, 40-bed orthopaedic ward in general hospital. Both have a number of residencies for those desiring to enter field.	

TABLE III
MEDICAL SCHOOLS WITH HOSPITALS WHICH HAVE ORTHOPAEDIC DEPARTMENTS

Medical School	Hospitals with Orthopaedic Departments	House Officers			Residents			Comments
		Orthopaedic Surgery <i>Length of Service</i>	General Surgical Service <i>Time on Orthopaedics</i>	Part of Rotating Service <i>Time on Orthopaedics</i>	Orthopaedic Surgery <i>Length of Service</i>	Orthopaedics and Pediatrics <i>Length of Service</i>	General Surgical Service <i>Time on Orthopaedics</i>	
Crichton	General hospitals			Yes Part of 1 year				
	Duke		7 weeks			1 for 1 year		
	Emory		Yes				2 afternoons per week during year in Orthopaedic Out-Patient Department in charge of orthopaedic and fracture work in hospital, rest of time spent in general surgery	
Hahnemann		3 weeks of service for each intern					Must be familiar with Orthopaedic Surgery. In Out-Patient Department from 1:00 to 1:00 Mon Wed and Fri	
Marquette		1 1/2 months (junior intern's) 3 months (senior intern's)						
Maryland	Kernan for crippled children	4 months (rotate with house officer at Johns Hopkins and Children's Hospital School)			1 year			
	University	4 months			6 months*			

TABLE III (Continued)

Medical School	Hospitals with Orthopaedic Departments	House Officers			Residents			Comments
		Orthopaedic Surgery <i>Length of Service</i>	General Surgical Service <i>Time on Orthopaedics</i>	Part of Rotating Service <i>Time on Orthopaedics</i>	Orthopaedic Surgery <i>Length of Service</i>	Orthopaedics and Fractures <i>Length of Service</i>	General Surgical Service <i>Time on Orthopaedics</i>	
Meharry	Yes						Resident serves in this division the year around	
Oklahoma	State University			Yes 1 month	2 second-year Residents and 1 third-year Resident spend entire time			
Pittsburgh	Oklahoma Hospital for Crippled Children Elizabeth Steele Magee Children's Presbyterian	1 month 1 month 1 month		Yes 1 month			3 months	
Rochester	Strong Memorial		1 year in orthopaedic and surgical (6 weeks in Orthopaedic Out-Patient Department)		Assistant 3 months. Associate 1 year			Orthopaedic wards not separate
Southern California	Los Angeles General Children's Hospital of Los Angeles				3 Residents 18 months 1 Resident 1 year			
Syracuse	University Syracuse Memorial	6 weeks (including fractures) 6 weeks					General supervision of orthopaedic cases	Resident in Pediatrics has charge of Orthopaedics

TABLE III (Continued)

Temple	Temple University Shriners	2 months 2 months					First assistant 2 months Second assistant 2 months 1 hour per week ward rounds, 2 hours per week operative rou- tine Orthopae- dic Service	
	Memphis General							
Peppers	Baptist Memorial	2 months						
University of Virginia	University of Vir- ginia	1 month (dur- ing second year)				One Resident 1 year minimum, may serve longer		

TABLE IV
SHRINERS' HOSPITALS—GRADUATE TRAINING IN ORTHOPAEDIC SURGERY

Hospital	Resident Surgeon	Length of Service	House Officers	Length of Service	Future Plans
California San Francisco	One	1 year, usual appoint- ment 2 years, usual length 2 years and 8 months, length of present incumbent's service	None In 1932 and 1933 used limited internship with Univer- sity of California Unsatisfac- tory as many not interested pri- marily in Orthopaedic Surgery and frequent changes unsatis- factory for Service	1932 and 1933 3- month periods	July 1934, plan for new service Assistant Res- ident to serve 1 year, if satisfactory to be ap- pointed as Resident (pre- requisite, 1 year's in- ternship)
Kentucky Lexington	None (20 beds)		Internes in Good Samaritan Hospital serve		

TABLE IV (Continued)

Hospital	Resident Surgeon	Length of Service	House Officers	Length of Service	Future Plans
Louisiana Shreveport	One	2 years (Requirements degree from Class A medical school, 6 months' general internship, 6 months' preliminary training in Orthopaedic Surgery)			
Massachusetts Springfield	One	1 year	Receive senior internes from Springfield Hospital	2 months	
Minnesota Minneapolis	None		Internes from Miller Hospital, St Paul (part of rotating Service)	7 weeks	July 1934, interne from University Hospital (part of rotating Surgical Service)
Missouri St Louis	One—Assistant Resident from Surgical Dept of Washington University	1 year, but all Residents have stayed 2 years Rotates through hospital as part of Surgical Service of Barnes Hospital	Internes from Surgical Dept of Washington University	Rotate through hospital as part of Surgical Service of Barnes Hospital	
Oregon Portland	One	1 year, minimum	One	7 weeks rotating	
Pennsylvania Philadelphia	One	1 year, minimum			
South Carolina Greenville	An assistant surgeon serving as Resident	Present incumbent at hospital 6½ years Will probably leave in 1935			In 1935 hope to establish residency of 18 months' to 2 years' duration
Utah Salt Lake City	None		None (Internes at St Mark's Hospital receive instruction in this unit)		
Washington Spokane	None (20 beds—ward leased from St Luke's Hospital)		Internes from St Luke's Hospital rotate on this Service	4 months	

TABLE V

MEDICAL SCHOOLS WITH HOSPITALS WHICH HAVE NO ORTHOPAEDIC DEPARTMENTS

Medical School	Hospitals Having No Separate Department for Orthopaedic Surgery	Time Spent on Orthopaedic Surgery by House Officers	Time Spent Mostly on Orthopaedic Surgery by House Officers	Resident in Surgery Cares for Orthopaedic Cases
Arkansas	True			
Baylor	University City-County	28 days	28 days	
Georgetown	True			
Howard	Freedman's			
Jefferson	Jefferson	1 month exclusively to Orthopaedic Surgery		
Louisville	True			
Lovola	True			
Medical College of Virginia				Yes Assistant Resident spends 3 months a year on Orthopaedic and Fracture Service
Nebraska		1 month		
Oregon	Multnomah	Approximately 1 month		Yes
	Children's	Approximately 1 month		
South Carolina				
Vermont	Mary Fletcher	Part of Surgical Service		
Woman's Medical College of Pennsylvania	Hospital of Woman's Medical College of Pennsylvania	2 months in Orthopaedic Out-Patient Department (held once weekly)		

ship of at least two years or a one-year surgical internship. At the New York Orthopaedic Hospital, the internes receive \$50.00 per month and maintenance. The Fellows on full-time work from 8:00 a.m. to 6:00 p.m. and receive an adequate salary.

The course in Orthopaedic Surgery offered at the Harvard Medical School now consists of eight months of pathology, an internship of eight months at the Children's Hospital, and eight months at the Massachusetts General Hospital, making a total of twenty-four months. Both hospitals have a Chief Resident on each Service, part of whose time is spent in teaching. These residencies last for one year or more.

Tables are included which show in detail the reports from the various schools and hospitals.

Respectfully submitted
 WILLIAM E. GALLIE, M.D., Toronto, Canada
 DEFOREST P. WILLARD, M.D., Philadelphia, Pennsylvania
 EDWIN W. RYERSON, M.D., Chicago, Illinois
 ILEROI C. ABBOTT, M.D., San Francisco, California
 FRANK R. OBBER, M.D., Chairman, Boston, Massachusetts

News Notes

The Annual Roll Call of The American Red Cross to enlist members for 1936 will be conducted throughout the nation from Armistice Day to Thanksgiving Day, November 11-28, 1935

Dr Walter P Blount has moved his office to Suite 1410, Wells Building, 324 East Wisconsin Avenue, Milwaukee, Wisconsin

The Annual Meeting of the **Western Orthopedic Association** is to be held in San Francisco on October 25 and 26, 1935 Two days of scientific sessions will be devoted to the presentation of papers by outstanding orthopaedic surgeons of the Pacific Coast and to clinical meetings at San Francisco Hospital, Stanford Hospital, and Mount Zion Hospital A cordial invitation to attend the sessions is extended to all members of the profession interested in orthopaedic surgery Further particulars may be obtained from Merrill C Mensor, M D , Secretary, 490 Post Street, San Francisco, California

At the request of the **American Committee for the Control of Rheumatism** a sub-committee has recently prepared an important report entitled "The Present Status of the Problem of 'Rheumatism', A Review of Recent American and English Literature on 'Rheumatism' and Arthritis" The members of this sub-committee include Philip S Hench, M D , Chairman, Walter Bauer, M D , Almon A Fletcher, M D , David Ghrist, M D , Francis Hall, M D , and Preston White, M D The report was published in *Annals of Internal Medicine* (VIII, 1315, 1495, 1673, April, May, and June 1935) and reprints are available to any physician interested They may be obtained at one dollar each from the Secretary of the American Committee for the Control of Rheumatism, Loring T Swaim, M D , 372 Marlborough Street, Boston, Massachusetts

The Spring Meeting of the **British Orthopaedic Association** included a visit to Le Touquet, with headquarters at the *Hotel des Anglais* Scientific sessions were held at Berck-sur-Mer on April 26 and 27

On the first morning a clinic was held at *L'Hôpital Maritime de Berck* where Dr André Richard performed an arthrodesis on a child of fourteen with tuberculous disease He used an iliac flap, the free end of which was tucked into the greater trochanter Dr Delahaye demonstrated his method of arthrodesis of the knee in which the upper end of a long graft is fixed in the femur, the middle portion rests firmly on the patella, and the lower end is fixed into the tibia, the whole operation being extra-articular He showed a number of patients on whom this operation had been done successfully Dr Louis Allard then discussed sacro-iliac tuberculosis and illustrated his two methods of fusion, the one intra-articular and the other extra-articular

On the morning of the second day the group met at *La Fondation Franco-Américaine de Berck*, where Dr Jacques Calvé and Dr Marcel Galland demonstrated their methods of treating tuberculosis of the spine, hip, and knee Their talk was illustrated with lantern slides and they presented a number of patients who had been treated by their methods

Among the guests present at the Association Dinner on Friday evening, April 26, were Dr Pouget, Mayor of Le Touquet, Dr André Richard, Dr A Delahaye, Dr Louis Allard, Dr Jacques Calvé and Madame Calvé, Dr Marcel Galland and Madame Galland, and Dr M Mozer

The Davis and Geck Fellowship Fund, which was established in 1930 for experimental work in Surgery at Yale University School of Medicine, has been renewed for another period of five years. The administration of this Fund is under the Department of Surgery which selects the graduate students for assignment as Davis and Geck Fellows.

During the past five years, there have been published a number of papers embodying results of these research studies. The subjects of these articles have included healing of wounds as determined by their tensile strength, velocity of growth of fibroblasts in the healing wound, factors determining the loss of strength of catgut when embedded in tissue, breaking strength of healing fractures, effect of high-protein diet on the velocity of growth of fibroblasts in the healing wound, influence of a diet rich in casein on the strength of bone and the healing of fractures, age factor in the velocity of growth of fibroblasts in the healing wound, strength of the healing wound in relation to the holding strength of catgut sutures, phosphatase content of fractured bone, effect of complete and partial starvation on rate of fibroplasia in the healing wound, histology of healing fractures in rats on normal diets and on diets low in total salts, calcium, and phosphorus, effect of standard diet and of high-fat, high-carbohydrate, and low-calcium diets on the breaking strength of healing fractured fibulae of rats, tissue response to catgut absorption, silk and wound healing, reaction to injury as a function of growth, influence of bilateral ovariectomy on breaking strength of healing fractured fibulae.

At the meeting of the Executive Committee of the **British Orthopaedic Association** held in July the following were elected Full Members:

Mr A V Meehan, Wickham Terrace, Brisbane, Queensland

Mr H J Seddon, The Royal National Orthopaedic Hospital, Brockley Hill, Stanmore, Middlesex.

Mr Philip Wiles, 90a, Harley Street, London, W 1

The following were elected Associate Members:

Mr Harold Dodd, 42, Harley Street, London, W 1

Mr H H Lanston, Treloar Cripples Hospital, Alton, Hants

Mr A J Watson, Hammersmith Hospital, Ducane Road, Shepherd's Bush, London, W 12

The American Board of Orthopaedic Surgery, Inc, incorporated in 1934, has met with the approval of the Advisory Board for Medical Specialties and is functioning in the examination and certification of candidates in the specialty of Orthopaedic Surgery.

The next examination of the Board will be held in St Louis in January 1936. Candidates desiring to appear before the Board at that time are requested to submit their applications prior to November 1, 1935.

An applicant must have the following qualifications:

- 1 He must be a graduate of a medical school approved by the Council on Medical Education and Hospitals of the American Medical Association
- 2 He must be of high ethical and professional standing
- 3 He must be duly authorized to practise medicine in the state or province of his residence
- 4 He must be a member of the American Medical Association or of another society approved by the Council on Medical Education and Hospitals of the American Medical Association
- 5 He must have had one year of internship in a general hospital acceptable to the Board
- 6 After 1935, he must have had three years of concentrated instruction in orthopaedic surgery approved by and acceptable to the Board
- 7 He must have had two years' further experience in the actual practice of orthopaedic surgery and he must have knowledge of the basic medical sciences related to orthopaedic surgery.

Applications should be sent to Fremont A Chandler, M D, Secretary, 180 North Michigan Avenue, Chicago, Illinois.

Current Literature

LA TUBERCULOSE OSTÉO-ARTICULAIRE. ÉVOLUTION—DIAGNOSTIC DE DÉBUT ET TRAITEMENT By Jacques Calvé, M D, with the collaboration of M Galland, M D, and M Mozer, M D (*In Bibliothèque de Phthisiologie, under the direction of Prof Léon Bernard*) PARIS, Masson et C^o, 1935 50 francs

The author has presented a work devoted to the subject of tuberculous osteo-arthritis, with no attempt to cover other conditions with which orthopaedic surgery deals. His very wide experience with this special phase of work, combined with his long experience in the broader field of orthopaedic surgery, as well as his many years of association with Prof Ménard, makes him particularly qualified to present this work. The monograph is one of a series issued under the direction of Prof Bernard on the subject of phthisiology.

The author has persistently adhered to the position taken by Ménard, and by himself during the training of his earlier years, that this is a general, not a local, disease, and that the joint condition is but a local manifestation in an individual already a subject of tuberculosis. Therefore, it must be accepted that (a) the patient is already tuberculous before the appearance of the lesion, (b) that, with a tuberculous osteo-arthritic lesion, he remains tuberculous during the course of the disease, (c) that, even with the cure of this focus, he remains a tuberculous individual after the termination of the cause of this lesion.

Consistent with this view, the author insists on the equal importance of the general and local treatment, and emphasizes the principles laid down by Ménard:

- 1 That every osteo-arthritis has a minimum duration before it can be cured,
- 2 That even slight interruptions in the continuity of treatment endanger a relapse,
- 3 That a tuberculous osteo-arthritic lesion cannot be cured except under favorable climatic conditions,
- 4 That the return of function of the part must not be allowed until after definite tests have been passed.

Based on this conception of the character of these lesions, the author has consistently built his views of grouping the types of cases,—as to examination, diagnosis, and treatment. He goes into detail on the subject of the evolution of these different lesions, dividing them into groups based on the clinical, pathological, and roentgenographic evidence. He has wisely emphasized the importance and value of clinical diagnosis and calls attention to the errors of depending exclusively on the results of laboratory tests (except when they give a definite evidence), and minimizing the value of clinical signs and observation. The results of his experience in examination, diagnosis, and determination of treatment, as given in this work, will be found of great practical value.

In the generalities of treatment, with which he introduces the portion of the book devoted to this part of the subject, he emphasizes the necessity of the distinction between the closed osteo-arthritis, which is due to the pure Koch bacillus, and the open (infected), in which other bacilli are added to the tuberculosis bacillus,—a distinction not usually given sufficient prominence in works on this subject. The discussion of treatment is divided between the closed and open forms.

Further division is made into what are considered (1) the methods which form the integral part of the principles advocated by Ménard and which are based on the belief that tuberculous osteo-arthritis is a local manifestation in a general disease, which latter must have attention equal to that given to the local lesion, as well as the belief that these lesions can be cured, (2) those methods, medical and surgical, which have for their object the modification of the evolution of the disease. The conservative treatment by absolute rest to the part is consistently emphasized, but, along with the elaboration of this treatment, the surgical procedures of today, with the reasons for them and the results which they are destined to accomplish, are discussed frankly and without prejudice.

Particular attention is given to the treatment by ankylosis of the larger tuberculous joints. The author strongly condemns the opening of old tuberculous abscesses, and gives in detail the method of treatment by puncture and injection.

In the latter part of the book, the description and use of apparatus are given careful consideration, as is necessary in accomplishing the rest treatment and supplementing the operative measures.

The book is unusual in its consistent exposition of the author's opinions and of his plan in dealing with this difficult problem, based on his elaboration of the principles advocated by Ménard. One cannot read this book without obtaining clear and definite pictures of this many-sided disease.

THE HUMAN FOOT. By Dudley J. Morton, M.D. New York, Columbia University Press, 1935. \$3.00.

For a number of years, Dr. Morton has been interested in the anatomical and clinical problems of the human foot, and his papers on these subjects have been valuable contributions to our current literature. This volume is the cumulation of his experience and research, and presents a complete study of the evolutionary development, physiology, and functional disorders of the human foot.

The evolutionary development of the human foot is traced in detail from the origin of vertebrate limbs in the earliest fishes through the amphibian, reptilian, mammalian, and early primate forms of life. There is an elaborate consideration of pro-anthropoid and anthropoid changes and of the terrestrial modifications of the gorilla and of early pre-human feet. Finally the author traces the development of the human foot and the evolution of its musculature and that of the leg. These progressive, comparative, anatomical studies, involving a wide range of investigation, constitute the anatomical basis of the work.

Departing now from the usual morphological basis of such studies, the author next considers the physiology of the human foot. He has studied particularly the relation of the center of body weight to foot function, the weight distribution and axis of balance of the foot in stance, the structural and postural stability of foot balance, gravity and propulsion and the angle of gait in locomotion, and the mechanics of the foot in walking and in running. These studies are based upon clinical examinations of the living, not only among apes and African savages, but among normal individuals under conditions of civilization. This section constitutes the physiological background upon which, as well as upon the anatomical considerations, the study of functional disorders is based.

At the beginning of the third section the author describes the technique of examination in the analysis of 150 cases of American men and women at the New Haven Hospital. These methods include not only the x-ray, but anatomical measurements, the taking of footprints on an inked fabric, and a series of functional tests. From an analysis of these cases it is concluded that the chief anatomical and physiological factors underlying functional disorders of the feet are: shortness of the first metatarsal bone, posterior location of the sesamoid, dorsal hypermobility of the first metatarsal segment, variation in relative supinator-pronator strength, and shortness of the calf muscles. The author describes in detail the methods of determining which one or more of these factors are present in a given case of foot disorder and also discusses appropriate methods of treating these clinical factors with a view to their relief.

This monograph, which is illustrated by 100 admirable original figures, is not only an extremely interesting piece of research in comparative anatomy and physiology, but a very valuable, clinical contribution to the orthopaedic problems associated with disorders of foot function.

A TEXT-BOOK OF FRACTURES AND DISLOCATIONS COVERING THEIR PATHOLOGY, DIAGNOSIS, AND TREATMENT. Ed. 3. By Kellogg Speed, B.S., M.D. Philadelphia: Lea & Febiger, 1935. \$11.00.

Speed has again revised and rewritten this text-book. The Third Edition is even

larger than the others, and contains 1,000 pages with 1,042 engravings. Many sections have been entirely rewritten.

There are many features which make this book admirable for a man dealing with fractures. While waiting to review this book, the abstractor has put it to the crucial test,—i.e., he has turned to it for advice in handling several acute fracture problems. He has found the material well indexed and arranged, the general principles, the anatomical considerations, and the details of treatment concisely discussed.

The illustrations include excellent line drawings of fracture apparatus, tracings from roentgenograms, and photographs of patients with the apparatus in place. The essential features of treatment are clearly driven home by these illustrations. The writer says that he has tried to avoid fads, this is apparent throughout the book. The subject matter is based on sound experience, it is all meat.

In many chapters a careful reference bibliography has been prepared, which makes the book of especial value to one who wishes to read further on a given subject.

TRAITEMENT DES FRACTURES ET LUXATIONS DES MEMBRES. By Prof Jacques Leveuf, Dr Charles Girode, et Dr Raoul-Charles Monod. Paris, Masson et Co, 1935, 50 francs.

This book is the outcome of the course given by Prof Delbet on the subject of fractures and dislocations, and follows, therefore, the line of teaching which is presented by him. It is in general an exposition of his methods, which differ somewhat from those which are more usually accepted and practised. In the first part, the general consideration of the essentials of examination and diagnosis and the principles of treatment are given and in sufficient detail to be of practical aid. The remainder of the main portion of the book treats of the various types of fractures which are met with in the different regions. Each form is described, but the emphasis is placed on the treatment, rather than on a discussion of the details of the examination, and diagnosis of the various fractures in each area. The book deals principally with the different methods of treatment as applied to the various types of fractures, the principles of which can be used with other injuries in the same regions. The conservative methods and means employed are first considered, with description of splints and plaster application, and then follows a consideration of the operative measures, with indications for their use and the reasons for their choice. Much stress is put on the necessary details of the operation, including preparation and post-operative care. It is particularly in this portion that one finds the methods employed by Prof Delbet most clearly shown. The subject of the treatment of fractures of the femoral neck is given special attention and the various methods of treatment in use, both conservative and operative, are very fully considered.

The book is well and fully illustrated, mainly by drawings, which lend themselves to the demonstration of the apparatus and its application. The illustrations of fractures are mainly diagrammatic,—evidently tracings of x-rays, which show clearly the lines of fracture and of displacement.

This book was prepared by Prof Leveuf, Dr Girode, and Dr Monod as an exposition of a course of lectures and instruction given by Prof Delbet—a course which was first given by request—and therefore particularly represents the practice pursued by him. His prominence in the department of surgery comprising the treatment of fractures and dislocations gives especial interest and value to a work of this kind.

As a practical aid to the surgeon dealing with fractures and dislocations, the book will be found of very distinct value.

TREATMENT OF FRACTURES. By Docent Dr Lorenz Böhler. Fourth English Edition. Translated from the Fourth Enlarged and Revised German Edition by Ernest W Hey Groves, M S, M D, F R C S. Baltimore, William Wood & Company, 1935. \$12.00.

The views of Prof Böhler on the subject of fractures have an universally recognized authority and he has contributed very greatly to the improved methods of treatment.

The principles of his teaching are based on the necessity of a thorough understanding of the anatomy of the fracture and on the advisability of sufficient apparatus and of preparation for carrying out the treatment. His direct and decisive methods of attacking the problems constantly encountered in this special department of surgery have contributed much toward raising the standard of the results which shall be accepted.

This Fourth English Edition is from the Fourth German Edition and the author has had the definite advantage of having this translation made by Ernest W. Hew Groves of England. To have material of high technical character transferred into another language by one who from long experience is so thoroughly acquainted with the subject adds to its accuracy. The choosing of the proper words and expressions to convey the original purpose of the author can be accomplished only by one whose familiarity with the expressions has come from practical experience with the terms and conditions involved.

This Fourth Edition is presented on practically the same plan as were the earlier issues, with full descriptions of each division, and gives much information for those who wish to learn of the fundamental details, as well as the presentation of new methods for those who have had experience. Very much has been added to this text, which is now even more fully illustrated, so that this Edition has 670 pages, with 1,056 illustrations. The results of the author's study of the anatomy and pathology of the various fractures appear in this book. Of interest in the portion in which the general principles of treatment are discussed will be found the explanation of the mechanism of the production of deformities, illustrated by numerous diagrammatic drawings, which in themselves also indicate methods of the reduction of such deformities. Much space is also given to the description and application of apparatus used in this treatment, emphasizing the necessity of sufficient and efficient means in the reduction and retention of these injuries.

Recently Prof. Böhler has occupied himself particularly in the study of fractures of the spine and of the neck of the femur. The methods of treatment which he advocates in these fractures show the same direct aim and decision that characterize his methods in all fractures. Especially with fractures of the spine his course of treatment quite departs from the more usual practice.

This latest presentation by Prof. Böhler of his methods, which have contributed so much of value to this department of surgery, will be cordially received.

THE AMERICAN ILLUSTRATED MEDICAL DICTIONARY. Ed 17. By W. A. Newman Dorland, A. M., M. D., F. A. C. S., with the collaboration of E. C. L. Miller, M. D. Philadelphia: W. B. Saunders Company, 1935. \$7.00.

The Seventeenth Edition of The American Illustrated Medical Dictionary, edited by Dr. Dorland with the collaboration of Dr. Miller, enlarges the field of usefulness of this book, which has found a place of its own since the date of its first appearance. It is now considered a necessary part of every library and of the offices of a very large majority of practicing medical men.

This last edition represents the work of three years on the part of a large corps of collaborators, and several thousand new terms have been added. These new terms have been as fully described as is possible in a book of this type. This work now comprises a volume of 1,573 pages and 945 illustrations and represents an increase of more than 100 per cent. over the first edition. No greater proof could be had of its usefulness and of the appreciation of its value. This issue has also had the advantage of the aid of the staff of the American Medical Association in its editing.

Although it is termed a dictionary, it is much more than that. Of added interest are the photographs and the mention of the men who have made some special contribution to the practice of medicine and surgery in years past. The many diagrams which have been added, as well as the tables and illustrations of some of the particular conditions, make this book one of general reference. A dictionary of this kind is particularly valuable now, with the many changes in the generally accepted nomenclature and when the derivation of terms is being more carefully scrutinized.

This book will be a handbook of reference to the busy practitioner, to help him in his

daily problems, as well as to the student, who will find its more technical descriptions and definitions of value. There are many colored plates, which are of interest and value to all, and which can be used for frequent reference.

This book will have its usual welcome.

THE THEORY AND PRACTICE OF ANAESTHESIA By M. D. Nosworthy, M.A., M.D., B.Ch. (Cantab.) London, Hutchinson's Scientific and Technical Publications, 1935. 12 shillings, 6 pence.

Dr. Nosworthy emphasizes the fact that the art of anaesthesia has rightly developed into a science along with the other branches of medicine. He also points out that, with the advancement in the many new drugs and procedures of technique involving their administration, expert judgment is required of a physician who wishes to practice anaesthesia. In a small book of 208 pages, Dr. Nosworthy briefly describes to the medical students, practising medical and surgical men, and physician anaesthetists the physiological requirements and reactions in anaesthesia. He gives a very concise, complete description of the medical preparation of the patient, the various methods of administration with the difficulties, and the after-effects of anaesthesia. Each chapter is well fortified with accurate references to the teachings of the leaders in anaesthesia in Great Britain and the United States. This book can be recommended very highly to beginners as well as to the advanced students of anaesthesia.

GECOMPLICEERDE FRACTUUR IN ANTISEPSIS By Dr. J. A. C. Schepel. Den Haag, N. V. Drukkerij T110, 1935.

This book is devoted to the various methods of treatment for compound fractures, beginning with a comprehensive historical review dating from the time of Hippocrates. The author discusses the various causes of non-union in compound fractures, having particular emphasis on local causes, such as

1. Damage to the broken ends of the bone and surrounding soft parts,
2. Insufficient immobilization,
3. Too great a distance between broken ends,
4. Interposition of soft parts,
5. Locally active hormone,
6. Delayed calcification of the callus,
7. Influence of antiseptics.

The importance of an antiseptic as a cause of non-union is the purpose of this thesis. His contentions are based on observations in various clinics of the Netherlands and on experimental data on fractures in pigeons. He shows that iodine is a factor in delayed union and pseudarthrosis, but he presents no data on other antiseptics. Neither does he offer a satisfactory alternative for treating compound fractures without an antiseptic. However, it is his opinion that at present the most satisfactory method is to excise the wound edges and to rinse the wound with hydrogen peroxide, followed by packing with iodoform gauze, since iodoform in itself has no destructive power on bacteria. The author believes it is conceivable that the liberated iodine from the iodoform gauze can be localized sufficiently to affect the soft tissues but not to damage particularly the bone-forming tissues.

The experiments on pigeons bring up the question as to whether or not such data can be a true comparison with results in humans.

The book is of interest because it substantiates the idea of many American surgeons that iodine should not be introduced into a wound of a compound fracture, but that instead either a non-alcoholic solution should be used in such wounds or irrigation with saline solution should be instituted.

UNFALL UND CHIRURGISCHE TUBERKULOSE By Prof. Dr. Erich Schneider. (In Vorträge aus der praktischen Chirurgie, 3. Heft, Herausgegeben von Erich Lexer.) Stuttgart, Ferdinand Enke, 1935. 1.60 marks.

As one of a series of pamphlets, intended for the general practitioner, and sum-

marizing available facts and opinions regarding individual subjects in the field of medicine and surgery, this work contains a discussion of the relationship between injury and surgical tuberculosis. In general, the idea is conveyed that surgical tuberculosis is not dependent on previous trauma and the conditions are stated, under which it is justifiable to associate injury with inception or aggravation of the disease.

AIDS TO SURGERY By Cecil A. Joll, M.S., M.D., B.Sc. (Lond.), F.R.C.S. (Eng.), and Reginald C. B. Ledlie, M.B., B.S. (Lond.), F.R.C.S. (Eng.) Illustrated by H. H. Greenwood, M.B., B.S. (Lond.), F.R.C.S. (Eng.) Ed. 6. Baltimore, William Wood & Company, 1935. \$2.75.

English medical authors produce books of this type far more frequently than we do in this country and they serve a very good purpose. This particular one belongs to the Students' Aids Series and is a small octavo of 569 pages, with index. It is passing through its sixth edition since 1904, each one of which was reprinted at least twice. It presents a brief and concise description of practically every known surgical condition, arranged upon a regional, anatomical basis in the latter chapters. The first sections deal with inflammation, surgical bacteriology, gangrene, and ulceration, together with the systemic diseases that are incidental to direct bacterial invasion. Then follow wounds, tumors, shock, the surgical lesions of the vascular lymphatic systems, nerves, muscles, tendons, bursae, orthopaedic affections, and fractures. From this point on, through twenty-seven chapters, skeletal lesions and diseases of all other parts of the body and their organs, except the eye, are discussed. The volume is a very handy one, packed full of useful and easily accessible information.

DIE PYOGENE ALLGEMEININFektion UND IHRE BEHANDLUNG By Prof. Dr. Erich Lever. Stuttgart, Ferdinand Enke, 1935. 1.60 marks.

This is one of a series of writings intended to give information to the general practitioner, on matters of practical importance. The author reviews the more commonly accepted ideas of the etiological factors and the pathogenesis of systemic infection. Treatment is outlined for combating both the general condition and the local complications.

DER RHEUMATISMUS IM KINDESALTER UND SEINE BEHANDLUNG By Doz. Dr. Egon Helmreich. (Beihelfte zum *Archiv für Kinderheilkunde*, 6. Heft.) Stuttgart, Ferdinand Enke, 1935. 3.60 marks.

This booklet of sixty-three pages was published as a supplement to *Archiv für Kinderheilkunde*. Rheumatism is portrayed as a chronic infectious disease, which in its course presents three distinct stages in its pathology. The important features associated with rheumatism are rheumatic angina, cardiac complications, polyarthritis and chorea. Regarding treatment, the author emphasizes mostly the possibilities of chemotherapy.

The Journal wishes to acknowledge the receipt of the following publications sent to the Editorial Department:

Anales (Valencia), II, Num. 14-15, 1935.

Anales De Cirugía (Rosario, Argentina), I, No. 1, 1935.

Anales de Pediatría (Facultad de Medicina de Barcelona), II, Num. 16-17, 1935.

Bollettino e Atti della Reale Accademia Medica di Roma, LXI, Fasc. 1-3, 1935.

Bulletin of the National Tuberculosis Association (New York), XXI, Nos. 7-9, 1935.

The University of Chicago. The Medical Schools' Announcements for 1935-1936 Chicago, 1935.

Cleveland Clinic Quarterly, II, Nos. 1-2, 3, 1935.

Hospital for Joint Diseases of the City of New York. Twenty-Eighth Annual Report for the Year 1934. New York, 1935.

The Johns Hopkins University School of Hygiene and Public Health. Announcements for 1935-1936. Baltimore, 1935.

The Medical Age (Toronto), June 21, 1935

University of Pennsylvania, Graduate School of Medicine, Announcement for 1935-1936 Philadelphia, 1935

The Rotarian (Chicago), XLVII, No 1, 1935

Spitalul de Ortopedie și Chirurgie Infantilă "Regina Maria" din Cluj Cluj, Rumana, Cartea Românească, 1935

Program des 56 Fortbildungskursus der Wiener medizinischen Fakultät (Vienna), 1935

Verzeichnis der Arztkurse im Studienjahre 1935/36 Das Kursbüro der Wiener Medizinischen Fakultät (Vienna), 1935

EIN KLINISCHER BEITRAG ZUR KENNTNIS DER OSTEOCHONDRITIS DISSECANS (A Clinical Analysis of Osteochondritis Dissecans) John Hellstrom und Karl Ostling *Acta Chirurg Scandinavica*, LXXV, 273, 1934

Seventy-three cases of osteochondritis dissecans were studied and the observations tabulated in this monographic work In thirty-four cases the lesion was definitely of the medial condyle of the femur and in twelve it was elsewhere in the knee joint There were twenty-four cases with involvement of the elbow, and one each of the second metacarpal head, the second metatarsal head, and the talus There was a predilection for the laboring class and for young adult males The lesion was bilateral in the knee in four cases and in the elbow in two

Symptoms were tabulated in the order of frequency Pain and limitation of motion were prominent in the elbow, while hydrarthrosis, locking, obvious free body, and pain were important in the knee Locking occurred even before a free body had separated In three cases there were no symptoms Theories as to etiology were reviewed The lesion may be purely traumatic, but in the spontaneous type there may be a predisposition due to constitutional and hereditary factors A review of roentgenograms of 1,500 elbows and bilateral studies of the elbows of 206 males without local complaint showed that osteochondritis of this joint was less frequent in this series than in the series published by Nielsen

From a study of the literature and the end results of their own cases, the writers conclude that in osteochondritis dissecans of the elbow, neither symptom-free cases nor cases with acute symptoms need always be operated upon In the knee, operation should be the rule The operation should include the removal of an unseparated body but not extensive excision of the bed —W P Blount, M D, Milwaukee, Wisconsin

NAILING OF COLLUM FEMORIS FRACTURES Einar Fj Lindboe *Acta Chirurg Scandinavica*, LXXVI, 325, 1935

A detailed report is submitted of ten cases of medial and five cases of lateral fracture of the femoral neck treated by the Sven Johansson modification of the Smith-Petersen method The writer claims that a "good result is obtained more speedily by this method than by any other" in intertrochanteric as well as femoral-neck fractures —W P Blount, M D, Milwaukee, Wisconsin

THE PHOSPHATASE ACTIVITY OF TISSUES AND PLASMA IN TUMORS OF BONE Clifford C Fianseen and Regina McLean *Am J Cancer*, XXIV, 299, June 1935

The authors present a thorough review of the literature dealing with the phosphatase activity in the tissues and blood plasma in various conditions and diseases of bone and calcium metabolism Their original contribution consists of an extensive series of determinations of the enzyme in cases of bone tumor

They present in detail their technique of the determination, with tables showing the effect on the results of refrigeration, of duration of the extraction period, of various treatments of the turbid extract, of centrifugalization, and of variation in the substrate employed They also present a table of determinations on normal bone and muscle from various regions and ages

Determinations were carried out on tissue, plasma, or both, in thirty-seven cases of primary bone tumor, numerous cases of metastatic bone tumors, osteitis deformans, and various other bone conditions, as well as miscellaneous tumors of other organs. In general it was found that the determinations made on the plasma paralleled those made on the tissues.

Inconsiderable or slight increases of phosphatase activity were observed in cases of osteochondroma, adamantinoma, endothelial myeloma, giant-cell tumor, and the osteolytic type of osteogenic sarcoma. Marked increases were observed in all cases of the osteoblastic type of osteogenic sarcoma. Osteitis deformans and generalized osteitis fibrosa cystica also uniformly showed elevations in the plasma-phosphatase activity. Likewise, metastatic lesions of bone showed an elevation, probably due to the reparative attempt at osteogenesis. Cases of multiple myeloma showed phosphatase activity within normal limits.

The course of some of the patients with osteogenic sarcoma was followed by repeated determinations. It was found that after operation the phosphatase activity rather promptly drops to normal and that it rises again with recurrence or development of pulmonary metastasis. Transitory fall in phosphatase following x-ray therapy was noted. A fall was also noted as a terminal phenomenon in two advanced cases.

The authors conclude that a high value is strongly suggestive of osteogenic sarcoma in the absence of osteitis deformans, generalized osteitis fibrosa cystica, extensive metastatic disease of bones, and jaundice. They also suggest that a phosphatase determination may be of use in differential diagnosis of metastatic carcinoma of the bones and multiple myeloma. They adhere to the theory that the phosphatase is synthesized by the osteoblasts, and that the increase observed in osteogenic sarcoma is another instance of neoplastic cells continuing to produce a physiological secretion,—in this instance an enzyme.—*Grantley W. Taylor, M.D., Boston, Massachusetts*

A CASE OF DELAYED METASTATIC SARCOMA OF THE PLEURA, ILLUSTRATING THE DIAGNOSTIC VALUE OF ARTIFICIAL PNEUMOTHORAX. William Bromme, H. P. Nelson, and Thomas Findley, Jr. *Am. J. Cancer*, XXIV, 334, June 1935.

The authors present a case report, with photomicrographs and roentgenograms, of an "alveolar spindle-cell sarcoma" of the radius treated by radiation and amputation. Eleven years after onset, and seven years after amputation, pleural metastases developed which proved fatal after two years. The case is of interest as a late metastasis of a bone sarcoma and illustrates the value of pneumothorax in localizing and identifying pleural metastases.—*Grantley W. Taylor, M.D., Boston, Massachusetts*

A CASE OF GIANT-CELL TUMOR OF THE SACRUM WHICH INVADDED THE INFERIOR VENA CAVA. Albert C. Freeman, Kenneth K. Kinney, and Maurice R. Moore. *Am. J. Cancer*, XXIV, 345, June 1935.

The authors report a very interesting giant-cell tumor, primarily involving the sacrum, which invaded or destroyed by pressure both ilia and the two lower lumbar vertebrae. At autopsy the inferior vena cava was found filled with a thrombus of tumor tissue in continuity with the primary tumor. There were no true metastases. In their discussion the authors note that the sacrum is a very rare location for a giant-cell tumor. In their opinion there was ground for assuming that trauma was of etiological significance. The report is illustrated with photomicrograph, roentgenogram and a photograph.—*Grantley W. Taylor, M.D., Boston, Massachusetts*

SPONDYLITIS ANKYLOPOETICA BECHTREW. (Bechterew's Spondylitis Ankylopoetica.) Christian Hohne. *Arch. f. Orthop. u. Unfall-Chir.* XXXV, 277, 1935.

The author discusses the subject of ankylosing spondylitis on the basis of 130 cases. He particularly differentiates the ankylosing spondylitis from the spondylosis deformans. In the former group there is a localized articular rheumatism of the spine. The latter

logical factors of rheumatism are infections, among which the rheumatic iritis is found in many cases. The disease is associated with acceleration of the sedimentation time and involves principally asthenic individuals in the earlier ages. It begins insidiously and shows the bridge symptoms of indefinite rheumatic character, sometimes also intestinal signs of gastric pain, but without clinical or roentgenographic findings at first. Diagnosis can be made only after many years following the onset of the disease, when the stiffening of the spine is already far advanced. The x-ray finding is characterized by calcification of the sacro-iliac joint, calcification of the ligaments and the small joints of the spine, and demineralization of the bone. A number of roentgenograms are introduced.

The spondylitis ankylopoetica of the author coincides largely with the Strumpell-Marie type, but is distinguished from the spondylitis deformans.

On the other hand, the author does not acknowledge the different points of distinction between Strumpell-Marie and Bechterew types, since the different symptoms merge into each other.—*Arthur Steindler, M D, Iowa City, Iowa*

INTERINNOMINO-ABDOMINAL (HIND-QUARTER) AMPUTATION G Gordon-Taylor and Philip Wiles *British J Surg*, XXII, 671, April 1935

Hind-quarter amputation is probably the biggest operation in surgery. It requires a courageous surgeon to even consider it, to say nothing of accomplishing it successfully. The writers report five cases operated on by them with but two fatalities. They are to be congratulated.

The report of these cases is as beautifully made as the operative work must have been done. The article is illustrated by photographs of the patients before and after operation, by drawings of the tumors, by photomicrographs, and by anatomical drawings.

The indications for the operations and results in these five cases were as follows:

Case 1 Sarcoma of upper end of femur with involvement of the innominate bone. Death

Case 2 Osteoclastoma of the innominate bone. Recovery

Case 3 Chondroma of the innominate bone. Recovery

Case 4 Sarcoma of the pelvis. Death

Case 5 Sarcoma of upper end of femur. Recovery

The incision is carried from the crest of the ilium from behind the posterior-superior spine to the anterior-superior spine, it is continued downward and inward one and one-half inches below Poupart's ligament, toward the middle of the origin of the adductor brevis. The external iliac vessels are ligated at the level of Poupart's ligament. This ligament is divided at each end and the spermatic cord is drawn out of the way. The insertion of the rectus abdominis is divided, the anterior and posterior surfaces of the pubic bone cleared by blunt dissection, and the symphysis pubis divided by knife or saw.

The patient is then turned slightly and an incision made from the mid-point of the iliac crest down to meet the other incision in the cruroscrotal sulcus. The dorsum of the ilium is exposed and sawed through into the sciatic notch. The four remaining arteries are now ligated and divided. The nerves are injected with novocain and divided. The remaining muscles are then cut through. The muscles are used to reinforce the peritoneum and the skin is closed over.

The literature on the subject is well reviewed.—*Ernest M Daland, M D, Boston, Massachusetts*

PARAPLEGIA IN POTT'S DISEASE, WITH SPECIAL REFERENCE TO THE PATHOLOGY AND ETIOLOGY R Weeden Butler *British J Surg*, XXII, 738, April 1935

Eight hundred and one cases of tuberculous spines have been reviewed. Ninety-two cases (11.4 per cent) have shown paraplegia. The mean age of those developing paralysis is sixteen, and the commonest level at which paralysis occurs is the mid-dorsal region.

The writer reviews three types of paraplegia, discussing the clinical and pathological

aspects This article should be read in connection with the article which follows it (by Seddon) which deals more with the treatment of three types—*Ernest M Daland, M D, Boston, Massachusetts*

POTT'S PARAPLEGIA PROGNOSIS AND TREATMENT H J Seddon *British J Surg*, XXII, 769, April 1935

Pott's paraplegia is classified according to three types Type I is a paraplegia with early, active disease, Type II is associated in its onset with early, active disease, but it persists indefinitely, Type III occurs after a tuberculous spine appears to have healed

The writer advocates conservative treatment in the first type He advocates costo-transversectomy in the severe case which promises to be persistent and incision of abscesses in the cervical region

He is against operation in the second group if there is an acute thrombosis of the vessels supplying the cord Laminectomy is done when the spinal-tumor syndrome is present or when there is posterior spinal disease If there is compression by a sequestrum, the sequestrum should be removed Costotransversectomy is done in a few cases Hyperextension is important in some cases

The third stage may be prevented by efficient treatment of the tuberculous spine Treatment is conservative with laminectomy and graft in the more serious cases—*Ernest M Daland, M D, Boston, Massachusetts*

ON OSTEO-ARTHRITIS IN THE DORSAL INTERVERTEBRAL JOINTS A STUDY IN MORBID ANATOMY L R Shore *British J Surg*, XXII, 833, April 1935

This subject is not to be confused with osteo-arthritis of the spine This paper was written by an anatomist from laboratory specimens with no consideration of the clinical aspects of the subject Photographs of specimens show that this newly described condition appears in three main regions In the cervical spine its appearance is thought to be due to weight-bearing in the dorsiflexed cervical vertebrae A second group appears in the dorsocervical region, chiefly between the fourth and fifth thoracic vertebrae, localized here chiefly from the use of the upper limbs The third group is found in the lumbodorsal region,—due to the weight-bearing in the joints of the dorsiflexed lumbar column—*Ernest M Daland, M D, Boston, Massachusetts*

UNTERSUCHUNGEN ÜBER KYPHOSIS ADOLESCENTUM (Investigations on Juvenile Kyphosis) Bruns' Beitr z Klin Chir, CLX, 13, 1934

In this article the author reviews the different etiological considerations in juvenile kyphosis up to Schmorl's explanation He then follows Schmorl and considers the presence of herniations of the substance of the intervertebral disc as a more important symptom than the occurrence of kyphosis In quite a number of cases with the typical clinical picture, deformity of the spine was absent, but Schmorl's nodules could be demonstrated in the roentgenograms These herniations may be associated with pain so that pain is as a rule the earlier symptom The symptom of deformity seems to be overestimated In 45 per cent of twenty-nine cases, the deformity was not noticed by the patients or relatives in 21 per cent, other persons called the patients' attention to the deformity and even on clinical examination spinal deformity was absent in 21 per cent of the cases The author suggests, therefore, the term cartilaginous body disease because he sees in the herniation of the intervertebral disc the etiological factor of the disease *Friedl Freund, M D Iowa City Iowa*

MULTIPLE MYELOMA UND METASTATISCHE KNOCHENMARKSTUMOREN (Multiple Myeloma and Metastatic Bone Tumors) Kurt Horch *Brun Beitr z Klin Chir* CLVI 195, 1935

Multiple myelomata represent a systemic disease of the bone marrow and develop simultaneously in different places This condition is a leukoblastoma It differs from other hyperplastic processes of the bone marrow by its localized circumscribed appear-

ance and by its malignant growth. It differs from the real tumor formations of the bone marrow because they derive from the stroma, whereas myelomata have their origin in the parenchyma. The differential diagnosis between multiple myeloma and metastatic malignancy is clinically frequently very difficult, especially if a primary tumor cannot be found. The blood picture in both instances is that of secondary anaemia. Bence-Jones bodies, which are present in myeloma in about 80 per cent of the cases, do not rule out metastatic malignancy absolutely. Roentgenograms are, as a rule, of greatest value. The myeloma is characterized by smaller punched-out areas. If there are metastases to the lungs, myeloma can be ruled out safely.—*Ernst Freund, M D, Iowa City, Iowa*

THE ORTHOPEDIC TREATMENT OF CHRONIC ARTHRITIS. Ellis Jones. *California and West Med*, XLIII, 125, Aug 1935

The author discusses the pathology and treatment of the atrophic and hypertrophic forms of arthritis, laying special stress upon early preventive measures and preoperative treatment. He finds the most satisfactory results are obtained by the use of the Bristow-Smart coil and the Morton Smart unit in increasing blood supply to the joint. This is followed by the proper form and amount of physiological exercise and massage, which in most cases is induced automatically by the painless muscular contractions which these instruments induce. He also employs potassium iodide cataphoresis by means of a strong galvanic current.

Operative treatment is of relatively small use in the atrophic type, but is often of decided advantage in the hypertrophic type, especially in arthroplasties, removal of loose bodies, synovectomies, and stabilizations.—*Charles Lyle Hawk, M D, Los Angeles, California*

ÜBER OBERSCHENKELBRÜCHE (Fractures of the Femur). Hans v. Brucke. *Deutsche Ztschr. f. Chir.*, CCXLIV, 28, 1935

From 1922 to 1931, 87,051 patients were admitted to the accident ward of the First Surgical Clinic in Vienna. Of these patients, 327 had suffered fractures of the femur (fractures of the neck not included). In 25 per cent of the cases, the patients were children under ten years of age. Most of the industrial accidents occurred in patients from sixteen to thirty years of age, and pathological fractures were most common in patients over forty-five years.

In the first year of life, six patients out of seven showed a pure transverse fracture through the middle of the shaft, which probably was due to the lack of functional structure of the bone. The age group of one to five years comprised thirty-two children. There were twenty-six fractures of the middle of the diaphysis,—twenty-one were oblique, five, transverse, which shows that the functional structure was already well developed. With increasing age, the fractures were distributed over the whole length of the femur, so that, of the age group five to ten years, only 50 per cent showed discontinuity in the middle of the shaft, and the supracondylar fracture was more frequent. Pathological fractures occurred in 12 per cent of the cases.

The treatment in most of the cases consisted of extension (skeletal traction), combined with secondary manual reposition. Open reduction was performed in 2.5 per cent of the cases. In the last few years, there has been a growing tendency to replace surgery and primary plaster bandages by extension.

The mortality rate was 13.8 per cent (fifteen out of 327 patients died), the fracture of the femur was the immediate cause of death.

There were twenty-four cases of compound fracture; nine of these patients died of severe complications. The compound fractures were, if possible, transformed to closed fractures.

In five cases, a thigh amputation had to be performed, the lives of none of these patients could be saved.

Pseudarthrosis was observed in two cases,—one, a woman of eighty years with Paget's disease and subtrochanteric fracture, the other, a young woman twenty-one years of age, in whom the fragments had been wired.

Follow-up data could be obtained in only 117 cases. The results are classified in four groups: very good, satisfactory, unsatisfactory, and very poor. Shortening up to one and five-tenths centimeters is of no consequence; shortening of even two to three centimeters is not a great impairment. Very good results were obtained in 68 per cent (79 cases), satisfactory results, in 22 per cent (25 cases), unsatisfactory results, in 5 per cent (6 cases), and very poor results, in 5 per cent (6 cases). Altogether, 90 per cent showed very good or satisfactory results, in 10 per cent the results were not good. The average shortening was less than one centimeter and the average amount of flexion of the knee joint was 5 degrees. The main reasons for the poor results were the application of plaster casts and the surgical treatment. One of the great difficulties in treatment is the prevention of damage to the knee joint. This derives not so much from the extension as from protracted immobilization.—*Ernst Freund, M.D., Iowa City, Iowa*

ÜBER DIE LUXATION IM TALO-NAVIKULARGELENK (Dislocation of the Astragaloscaphoid Joint). Paul Huber. *Deutsche Zeitschr. f. Chir.*, CCXLIV, 632, 1935.

Dislocations of bones of the foot are rare and only a few are typical. Among these is the dislocation in the astragaloscaphoid joint. Fifteen cases have been reported in the literature. Considerations of importance in the differential diagnosis are:

(1) Dislocation of the scaphoid, in which the scaphoid is entirely loose and displaced.

(2) Dislocation in Chopart's joint, in which the joint between the cuboid and os calcis is also involved.

(3) Luxatio pedis subtalo, the most frequent of foot dislocations. In addition to the dislocation in the astragaloscaphoid joint, there is also present a dislocation between the astragalus and the os calcis.

The dislocation in the astragaloscaphoid joint is merely an incomplete luxatio pedis subtalo, in which the interosseous ligaments between the astragalus and calcaneum have not been torn. From a practical viewpoint, however, it is better to consider the dislocation in the astragaloscaphoid joint separately. Whereas the luxatio pedis subtalo can, as a rule, be reduced easily and is therefore of good prognosis, reduction of the dislocation in the astragaloscaphoid joint is frequently very difficult. A review of the literature shows that the results are not very gratifying. There are two reasons for the poor results: (1) The diagnosis is frequently not made correctly. (2) Reposition and retention are difficult.

Two cases are reported, in both of which closed reduction failed and open reduction was performed. The dislocation in the astragaloscaphoid joint is frequently overlooked because the deformity is relatively mild and the attention is centered more on the accompanying lesions, especially the dislocation of the tibio-astragaloid joint.—*Ernst Freund, M.D., Iowa City, Iowa*

FRACTURE SPONTANÉE DU FÉMUR ET MYO-ITE OSSIFIANTE TRAUMATIQUE PURE COÏNCIDENCE OU PROFONDE CAUSALE? (Spontaneous Fracture of the Femur Coincident with Myositis Ossificans Traumatica). A. Wojciechowski. *J. d. Méd. de Bordeaux*, CMI, 335, May 10, 1934.

A case is reported of a spontaneous fracture of the femur in a young man with myositis ossificans traumatica.

The possibility that the myositis was the actual cause of the fracture is discussed at some length, the author favoring the theory that the fracture was purely pathological.

A study was made by the author of the extent of decalcification in the region of the myositis focus and observations were made of the areas of decalcification in the proximum of the adjacent bone during the four or five weeks after injury.

Coincidence of myositis and fracture is rare, a fact easily explained by the short period of the decalcification as well as the natural avoidance of strenuous exercise during the early painful period of the myositis.

The similarity of march foot fractures is suggested.

TECHNIQUE DE L'ENCHEVILLEMENT DES FRACTURES DU COL DU FÉMUR (Technique of Screwing Fractures of the Neck of the Femur) M Merle D'Aubigne *Presse Méd*, XLIII, 555, Apr 6, 1935

Impressed by Smith-Petersen's statistics on the treatment of fracture of the neck of the femur by means of his screw, the author has developed a guide for determining the axis of the neck of the femur. By means of this guide, it is possible to insert a Kirschner wire, over which the Smith-Petersen nail is threaded. With the patient under spinal anaesthesia, the procedure is carried out through a small incision over the trochanter, without opening the hip joint.

The author reports five cases in which his technique has been used. He states that in all cases satisfactory reduction and retention of the fracture were obtained after screwing. One patient died of an embolism three weeks after operation, one patient is still under treatment, three others have had satisfactory bony union, although in one case only three months has elapsed since the operation. —Henry Milch, *M D*, New York, N Y

CONSIDÉRATIONS SUR L'OPÉRATION D'ALBEE DANS LE TRAITEMENT DU MAL DE POTT CHEZ L'ENFANT (Albee operation in the Treatment of Pott's Disease of Children) I Balacesco and I Maian *Presse Méd*, XLIII, 645, Apr 20, 1935

The authors express the opinion that, in tuberculosis of the spine, the earlier the operative intervention, the better the results will be. They draw their conclusions from a study of 288 cases operated on by means of Albee's technique over a period of seven and a half years.

The age range of the cases was as follows:

17 months to 2 years	27 cases
3 to 6 years	86 cases
7 to 10 years	84 cases
11 to 15 years	61 cases
15 years and over	30 cases

Twelve patients were operated upon at the very onset of the disease and 195 during the course of the disease. Thirty-seven presented abscess formation, four, fistulae, twenty-five, paraplegia, and eleven, complicating tuberculosis in the elbow, knee, ankle, testicle, and fingers. The localization of the lesions was as follows:

Cervical	3 cases
Upper dorsal	15 cases
Mid-dorsal	72 cases
Lower dorsal	63 cases
Dorsolumbar	51 cases
Lumbar	73 cases
Lumbosacral	5 cases

Fifteen patients were operated upon for involvement of one vertebra only, 135 for two vertebrae, and 138 were operated upon for tuberculosis involving from three to eight vertebrae.

Following operation, the patients are kept in the ventral position for a period of fifteen to twenty days, thereafter they are immobilized in plaster-of-Paris and are permitted to assume the dorsal position. The infants are kept flat on their backs in plaster-of-Paris for a period of one year, after which an orthopaedic support is applied.

In this series, there were no immediate postoperative deaths. One child died fifteen hours after operation from chloroform poisoning, one died three days after operation from diphtheria, another, on the fourteenth day from meningitis, and a fourth, on the fourteenth day from measles. Six patients died from tuberculous meningitis,—three, two months, two, three months, and one, a year after operation.

Ninety-four patients were cured, 129 were improved, and fifty-one were operated upon too recently to draw any conclusion. In all, the pain disappeared immediately af-

ter operation The gibbus did not become enlarged in any case, even when the x-ray showed progress of the lesion, except where walking was resumed too soon In twelve cases, paravertebral abscesses appeared after operation, but in most cases the abscess was cured by the operation

The operation appeared to exert a beneficent influence on the course of the paraplegia Fifteen cases of paraplegia were cured, five were improved, and seven were not re-examined Paraplegia developed in only two cases after operation, but these were promptly cured upon immobilization In thirty-three cases—patients who had walked within three to four months after operation—the graft broke In eight of these the fracture in the graft was healed in several months—*Henry Milch, M D, New York, N Y*

BLASTOMYCOSE OSSEUSE (Bony Blastomycosis) Marcel Meyer *Presse Méd*, XLIII, 558, Apr 6, 1935

The author calls attention to the fact that the diagnosis of Köhler's disease should be made with great reserve on a basis of a single clinical and roentgenographic examination In cases of tuberculosis, blastomycosis, or injury, one may find the same symptoms of pain, interference with motion, and compression of the tarsal scaphoid as revealed by the roentgenogram Still, the true nature of the condition cannot be adequately determined until the course of the disease has been watched

In confirmation of this, the author reports the case of a child, aged three who apparently had the characteristic clinical and roentgenographic findings commonly associated with Köhler's disease When the plaster was removed at the end of three months, the foot was bathed in pus and presented characteristics of Madura foot, with numerous discharging sinuses Culture of this pus revealed a typical infection by one of the saccharomycetic group Treatment consisted of exposure to the ultraviolet ray, the use of iodine, etc The child subsequently developed a metastatic mastoiditis from which the same organism was recovered—*Henry Milch, M D, New York, N Y*

MARTEAUX PNEUMATIQUES, MANIFESTATIONS MORBIDES PROFESSIONNELLES (Morbid Manifestations of the Use of the Pneumatic Hammer) André Feil *Presse Méd*, XLIII, 668, Apr 24, 1935

The author examined twenty-three laborers whose work entailed the use of pneumatic hammers Eighteen of these laborers had been thus employed from one to two years, three, more than two years and two, less than one year All complained of swelling in the arms and hands during work and trembling of the hands After work, they complained of pain in the wrist and in the arm and marked muscular fatigue This condition was so marked in some individuals that they spoke of a sort of 'paralysis' The most characteristic sign which the author found was that of the 'dead finger' Most frequently, the index and middle fingers were involved occasionally, each of the others were affected The 'dead finger' is characterized by a sensation of itching coldness, loss of sensation and mobility, and is occasionally associated with ischaemia which may resemble Raynaud's disease Cold appears to intensify the symptoms No statement is made anywhere of the development of any form of arthritis

The author advises cutting down the time during which the pneumatic hammer is used and alternating work with the pneumatic hammer with other types of work in which the hammer is not used—*Henry Milch, M D, New York, N Y*

L'OSTÉOTOMIE COURBE DE L'OS COXAL COMME TRAITEMENT DE L'ANKYLOSE DE LA HANCHE (Curved Osteotomy of the Femur and the Treatment of Ankylosis of the Hip) Al D Radulesco *Presse Méd*, XLIII, 822, May 22, 1935

The author calls attention to the numerous types of subtrochanteric osteotomies devised for the treatment of ankylosis of the hip in malposition

In preference to these types of operations which occasionally give circulatory or nervous disturbances the author suggests a curved pericapsular osteotomy The trochanter of the affected femur is exposed through a typical gullet-shaped incision The

tiocanter is then chiseled off and an osseomuscular flap is raised. By means of a curved osteotome, the whole area of ankylosis is freed by osteotomizing the tissues around the acetabulum. The malposition is corrected, the wound is closed in layers, and a plaster-of-Paris cast is applied.

The author believes that the operation is simple and may be used in all types of cases, even in cases of tuberculosis — *Henry Milch, M D, New York, N Y*

TRANSFORMATION EN CHONDRO-SARCOME D'UNE MALADIE OSTÉOGÉNIQUE (Transformation of an Osteogenic Tumor into Chondrosarcoma) Robert-Didier *Presse Méd*, XLIII, 915, June 8, 1935

A woman, thirty-one years old, was operated upon in July 1933 for a large exostosis of the anterior thoracic wall of three months' duration. This mass was removed and the pathological examination showed chondro-osteosarcoma. In October, the tumor had recurred and, at subsequent operation, two-thirds of the lower half of the sternum and from ten to twelve centimeters of the lower ribs were resected *en masse*. In April 1934, another recurrence was noted. A third operation was performed and since then the patient has remained well.

Because of the possibility that even an apparently benign exostosis may assume malignant characteristics, the authors advise early and complete excision of all osteochondiomas — *Henry Milch, M D, New York, N Y*

TRAITEMENT DES FRACTURES RÉCENTES DU COL DU FÉMUR (Treatment of Recent Fractures of the Neck of the Femur) M Boppe *Presse Méd*, XLIII, 1061, July 3, 1935

Attention is called to the fact that, in the treatment of fractures of the neck of the femur by the Whitman method, abduction of 25 to 30 degrees, with internal rotation of 15 to 20 degrees, is the position of election. An increase in the abduction or internal rotation leads to separation of the fragments. The author is much in favor of the use of the Smith-Petersen nail in the treatment of the recent fracture. This nail may be introduced by means of the extra-articular method, or by opening the joint. The author is in favor of the latter procedure and has used it in twenty-three cases, with excellent results — *Henry Milch, M D, New York, N Y*

OSTEO-ARTICULAR TUBERCULOSIS AND ITS TREATMENT P Kornev *Soviet Surg*, I, 8, 1935

In this article, Prof. Kornev, Director of the Leningrad Institute of Surgical Tuberculosis, discusses the results of treatment of 2,610 patients with osteo-articular tuberculosis, seen in the Institute over the past fourteen years, and presents a method for evaluating these results, based on a grouping of patients according to the degree and gravity of the disease and the amount of improvement. This system of classification he calls the "unitarian" method.

Of these patients, 1,217 had spondylitis, 577, involvement of the hip joint, 578, affections of the knee joint, 115, lesions of the ankle and foot, and 93, involvement of the upper extremity. The treatment consisted of a combination of conservative and operative procedures, neither of which was subordinated to the other. Special attention was given to the treatment of cold abscesses in order to prevent the formation of sinuses.

The average period of hospitalization was 290 days. There was a mortality rate of 8 per cent. Of the patients discharged, 75 per cent had satisfactory results and 25 per cent were not improved.

In the group with spondylitis, conservative treatment gave favorable results in 55 per cent of the cases; there was a mortality rate of 14 per cent. The results of the operative treatment were favorable in 89 per cent of the cases and there was a mortality rate of 4 per cent.

The author believes that the results of operation in small children do not differ from those obtained in adults. The impression of the author is that the immediate results of operative treatment are definitely good.

In the group with tuberculosis of the knee joint, good results were obtained by operation in 96.5 per cent, with a mortality rate of 1.7 per cent. In the cases treated by the conservative method, there was improvement in 73.5 per cent, with a mortality rate of 8.7 per cent. The author differs with Sorrel as to the inadvisability of knee resection in children. Eighty-eight patients below ten years of age were operated upon with satisfactory results. The author considers the problem of treatment of tuberculosis of the knee joint as solved. He believes that resection of the knee is not an act of despair after unsatisfactory conservative treatment, but is a part of the general conservative-operative treatment of the knee.—*Emanuel Kaplan, M D, New York, N Y*

CONCERNING THE EVALUATION OF LATE RESULTS OF THE SURGICAL AND CONSERVATIVE TREATMENT OF TUBERCULOUS SPONDYLITIS IN CHILDREN. L. P. Marianchik.
Soviet Surg, II, 79, 1935

The author bases his conclusions on observations made upon 170 patients. The ages of the patients varied between four and fifteen years.

Nine patients were operated on, the Albee bone-graft operation and its modification being used. Three of these patients died. The post-mortem examination in two cases revealed progressive tuberculous destruction of the vertebrae, although the bone grafts produced excellent fusion of the spine.

One hundred and sixty-one patients were treated conservatively and there were two deaths.

A comparison of the two groups, as to the character of complications, mortality, general condition of health, and amount of activity permits the following conclusions. The Albee operation with its modifications, although immediately satisfactory, produces later exacerbations of the tuberculous process and, therefore, should not be performed on children. The conservative method, consisting of the early and persistent use of all known climatological and orthopaedic measures, is preferable to the Albee operation in children.—*Emanuel Kaplan, M D, New York, N Y*

KNOCHENBILDUNG IN DER HAUT (Bone Formation in the Skin). Anton Mueger.
Wiener Klin Wchnschr, XLV III, 200, 1935

Bone formations in the skin, which cannot be explained by metaplasia of the local tissues, are not frequent. The localization of these formations is rather variable, but is mostly in the skin of the skull. If these bony areas are found at one place only, the lesion is called 'osteosis cutis circumscripta', if they are found in several places involving wider regions, the lesion is called 'osteosis cutis multiplex'. It may lie in the cutis or deeper, but it is mostly enclosed in tissue which apparently seems normal. The most logical assumption is that these bone formations develop from dispersed embryological germs or that they may develop on an atavistic basis. Also, bone formation may take place in the skin from metastatic bone-forming tumors of the skeleton. Although not proved, there is the possibility that traumatically displaced particles of periosteum lead to this type of bone formation. These ossified areas in the skin, if not of metaplastic origin, show either a tumorlike growth as in typical osteomata or a simple growth without blastomata or of hyperplastic character.—*T. M. Pich, M D, Louisville, Iowa*

GLITZEN, BREMSSEN, FEDERN. LEISTUNGSANATOMISCHE BETRACHTUNGEN ÜBER DEN PASSIVEN BEWEGUNGSAPPARAT (The Gliding, the Braking and the Springing Action of the Connective Tissue. A Consideration of Its Function with Relation to the Locomotor Apparatus). Erich Heidreich. *Ztschr f orthop. Chir*. LXIII 1, 1935

This article is simply a consideration of the role of loose connective tissue which forms a portion of the locomotor apparatus, and a description of the relation of this structure to the muscle action. Resisting formations are the hyaline synchondroses, the sutures, the fibrocartilaginous synchondroses, the elastic ligament, etc. The author

discusses the rôle of these formations, not only in respect to their braking effect, but also in regard to their effect upon the direction of motion — *Arthur Steindler, M D, Iowa City, Iowa*

ÜBER POLYARTIKULARE CHONDROMATOSE DER GELENKSKAPSEL (Polyarticular Chondromatosis of the Joint Capsule) Gerhard Haberler *Ztschr f orthop Chir*, LXIII, 22, 1935

The author reports a case of multiple chondromatosis in almost all joints. This is the first communication on a case of this kind, of general distribution. Polyarticular chondromatosis of the joint is very rare and the cases so far reported in the literature usually concern both knees, or both elbow joints. The patient in this case was the mother of a boy who had been examined for some congenital anomaly and deformation of the femoral head. The mother, herself, showed multiple free joint bodies in both shoulders, in both hip joints, and in both knees. All the joints showed signs of hypertrophic arthritis which was considered to be secondary to the osteochondromatosis — *Arthur Steindler, M D, Iowa City, Iowa*

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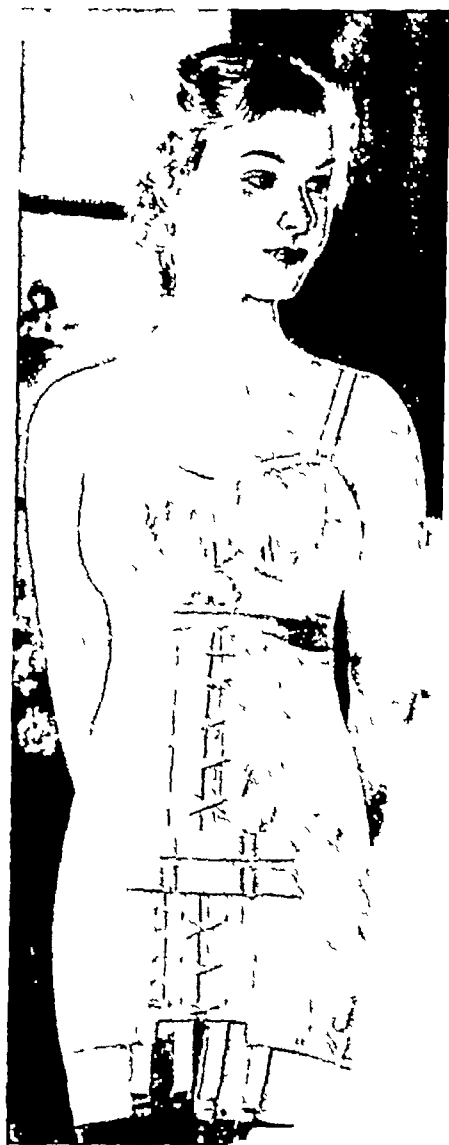
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A Simple and Light Sacro-Iliac Support

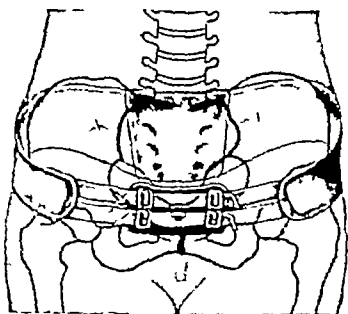
A simple band and pad, incorporated in a light weight flexible corset which *stays in place* is the SPENCER way of meeting the surgeon's need for efficient sacro-iliac support

Only by designing a garment to the *individual needs* (as Spencer designers do) is it possible to design a simple design with each section of the garment planned to give maximum figure support without aid of harness-like arrangements

No cumbersome straps and laces at the back of garment are necessary in a Spencer Sacro-Iliac Support. The garment is easy to adjust, inconspicuous and is *welcomed* instead of *objected to* by the well-groomed woman or man

Every Spencer Support is planned and cut to provide the "pull" of abdominal support on the pelvic girdle — NOT on the spine at, or above the lumbar region. The supporting and controlling features are a matter of DESIGN — not bulk or weight

Look in the telephone book under "Spencer Corsetiere" or write direct to us



Above Photograph of a Spencer Sacro-Iliac Corset and shadowgraph showing the pad that fits against the sacrum and the inner belt which encircles the pelvic girdle holding the illi in place

SPENCER

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THE SPENCER CORSET COMPANY INC. 127 Derby Ave. New Haven Conn.
(In Canada Spencer Corsets Ltd. Rock Island Quebec In England Spencer Corsets Ltd. 94 Regent St. London)

Please send to the patient whose name appears below complete information on Spencer Supports for the following

condition

Patient's Name

Address

Please send me your booklet on the use of Spencer Supports for (check the subjects in which you are interested) Blisters Conditions Hernia Sacro-Iliac Sprain Intercostal Intestinal Stasis Movable Kidney Pregnancy and Partum Support

Dr.

Address

